JPRS-UST-87-019
17 NOVEMBER 1987

FOREIGN BROADCAST INFORMATION SERVICE

JPRS Report

Science & Technology

USSR: Science & Technology Policy

JPRS-UST-87-019

17 NOVEMBER 1987

SCIENCE & TECHNOLOGY

USSR: SCIENCE & TECHNOLOGY POLICY

CONTENTS

/12223

ORGANIZATION, PLANNING AND COORDINATION

ACCELERATION OF DEVELOPMENT OF EQUIPMENT, TECHNOLOGY

Moscow EKONOMICHESKIYE NAUKI in Russian No 11, Nov 86 pp 21-30

[Article by Doctor of Economic Sciences A. Varshavskiy under the rubric "The Exchange of Opinions": "The Progress of Equipment: Means of Its Acceleration"(*); passages within slantline published in italics]

[Text] The thorough modernization of the national economy and its changeover to the path of intensive development can be accomplished only on the basis of the development, improvement, and extensive dissemination of advanced equipment and technology and the use of all the achievements of the scientific and technical revolution. In turn, the development of the scientific and technical revolution "involves the improvement of social relations, the reform of thinking, the development of a new psychology, and the establishment of dynamism as a way of life and a norm of existence. It urgently requires the constant revision and updating of the established systems of management."(1)

The successful solution of the problems of the acceleration of scientific and technical progress as the main lever of the increase of production efficiency depends on how the work on the improvement of management and the entire economic mechanism is carried out.(2) The basic directions of its reform, which were outlined by the 27th CPSU Congress, include the increase of the effectiveness of the centralized management of the economy with the simultaneous decisive broadening of the boundaries of the independence of associations and enterprises and their conversion to genuine cost accounting; the changeover to economic methods of management at all levels of the national economy and the corresponding improvement of the systems of pricing, financing, and lending, the development of anti-expenditure stimuli; the implementation of advanced organizational structures of management, the optimum combination of the sectorial and territorial management of the economy; the accomplishment of the comprehensive democratization of management, the increase of the role of labor collectives in it.

In the works, which are devoted to the problems of improving the economic mechanism for the purpose of accelerating scientific and technical progress, as a rule, the attention of researchers is focused on /individual/ specific problems of planning, management, stimulation, pricing, financing, lending, and so forth. Let us emphasize, however, that for all their unconditional importance it is impossible not to take into account that /there are general,

comprehensive problems, which are determined by the interaction of individual units of the economic mechanic/ and on which first of all the time and the realization of the development, introduction, assimilation in production, and extensive dissemination of advanced equipment and technology depend. The in-depth study of the diverse interrelations of the individual units of the economic mechanism is necessary for "the establishment of an integrated, effective, and flexible system of management, which makes it possible to realize more completely the possibilities of socialism."(3)

We support L. Logvinov in the view that now, as never before, the systematization and generalization of the political economic problems of scientific and technical progress are required, and at the same time believe that such systematization is necessary not only for scientific and educational purposes, but first of all for practical purposes.(4) The goal of this article is to attempt /to identify the general, comprehensive problems of the improvement of planning, financing, stimulation, and pricing, to analyze their interrelations, as well as to formulate a number of most important problems of socioeconomic development, on the solution of which/, in our opinion, /the acceleration of scientific and technical progress depends/. Such a study, so it seems to us, should precede the formulation of a unified concept of the improvement of the management of scientific and technical progress and at the same time can made available additional information, which is necessary for the formulation of its specific directions.

Technical Progress and the Improvement of Production Planning

The planning of industrial production and the retooling of operating enterprises is the most important unit of the overall system of state plans of economic and social development of the country, on the improvement of which the acceleration of scientific and technical progress directly depends.

As is known, the planning of the production of output is carried out in physical and value terms. The plans of production in value terms are drafted in accordance with the commodity production or other volume indicators, particularly the net output (standard), and their fulfillment is ensured by the output of products of a specific range and price. If it is assumed that the production of the given type of product is not planned in physical indicators, the condition $y_{пр} = \sum P_i N_i(x) = y_{пл}$, where $y_{пр}$ and $y_{пл}$ are the produced and planned commodity production, N_i and P_i are the quantity and price of product i; x is the vector of the required resource, is satisfied.

Obviously, under the conditions of positive economic growth rates, when $y^t_{пл} > y^{t-1}_{пл}$, the fulfillment and exceeding of the plan can be ensured by means of: a) the output of products of the range needed by the consumer at a fixed or even a decreasing level of prices (the ideal case); b) the increase of prices; c) structural changes in the director of more expensive items (with allowance made for resource limitations). Without a substantial increase of the expenditures of all types of resources (including time as one of them) it is easiest of all to accomplish the task posed by the party by the last two means. The first means presumes additional expenditures of time, labor, and material resources, especially in case of an increase of the number of items being produced. It is not surprizing that exterprises frequently choose an easier means of fulfilling the plan assignments.

The changeover to the planning of the production of output in physical terms looks like the most obvious means of eliminating the shortcomings which are connected with the use of value indicators. However, it also does not make it possible to eliminate a large number of problems, which are becoming aggravated in connection with the need for the acceleration of scientific and technical progress.

The increase of the output of new advanced items, the use of which accelerates scientific and technical progress and contributes to the fulfillment of national economic programs and to the accomplishment of specific tasks of the social and economic development of the country, is the main goal of the planning of production in physical terms. Since along with the plan of the production of the most important types of products the total production volume in value terms is established for the enterprise, the latter is made up of two parts, one of which is specified centrally by the production plan in physical terms, while the other can be planned centrally in value terms or be specified independently by enterprises (associations).

Hence it follows that, /first/, the planning of the production of output in physical terms should be based on an efficiently operating system of pricing, which prevents the groundless increase of prices and reflects the decisive role of the consumer. Otherwise prices may increase for the entire range of output being produced.

/Second/, the planning of the production of the basic products list in physical terms can be accompanied by an increase of the lag of the production of auxiliary types of equipment and technology, which at a specific stage of development threatens to become a significant factor of the slowing of the pace of economic growth. The analysis of the technical development of the sectors of the national economy shows that under the conditions of the prevailing system of management the concentration of the efforts of developers and production workers primarily on the output of the main types of equipment, basic production lines, and processes and the lag of the development of auxiliary equipment and technology had the result that the actual efficiency of the used systems of machines in a large number of cases proved to be less than the rated efficiency.(5) This situation cannot be corrected by means of individual steps on the change of the criterion of the evaluation of the economic activity of enterprises (associations). For example, the use of the profit as the most important generalizing indicator of the cost accounting activity of the enterprise under the conditions, when the role of the consumer is not decisive, can lead to an increase of the proportion of obsolete items in that portion of the output, the production of which is not planned in physical terms, since it is easier to decrease the expenditures on a product, which has been produced for a long time, than to assimilate the production of a new one, which corresponds to the latest achievements of scientific and technical progress. Consequently, the main problem here consists in how to see to it that the needs of the consumer of the product would be completely met.

/Third/, under the conditions, when a large number of leading directions of scientific and technical progress (first of all electronization, automation,

new technologies for the production and processing of materials) are characterized by an extremely large range of produced (used) equipment and technology and a significant scale of production (for example, the number of sold personal computers of various makes throughout the world now comes to several million), the use of just physical indicators in the planning of the production of output becomes unrealistic. They should be supplemented by value indicators in combination with a plan of the decrease of the average and unit prices for new items.

It is necessary to note that a significant increase of the output and sale of fundamentally new equipment in physical terms is possible, as practice shows, only in case of the slower increase of the corresponding production costs and volume indicators. In other words, the prices for new mass-produced equipment should decline and the more rapidly they do, the faster the growth rate of the physical indicators is.

For example, in the USSR the wholesale prices for power devices decreased: for diodes from 21 rubles each in 1967 to 12 rubles each in 1970 and 9 rubles each in 1982; for thyristors--respectively from 44 to 24 and 13 rubles each, here the annual production volume increased by several orders of 10.(6) Similar trends, which are being intensified by keen competition, are also being observed in the United States. Thus, the rapid increase of the scale of the production of computers is being accompanied by just as rapid a decrease of prices: for Apple personal computers in 1984 they declined from $2,000 to $1,300.(7) Let us note, however, that at present the prices as a whole for electronic instruments are decreasing in our country insufficiently rapidly. Thus, for several types of household electronic equipment the reduction of prices affected only 3 percent of the total value of the components, while for a number of radio parts the wholesale prices increased by two- to threefold (here enterprises of the electronics industry are striving for the mass production of the simplest components, since additional expenditures are necessary for the output of new items).(8)

/Fourth/, when planning the production of output in physical terms it is necessary not only to constantly take into account, but also to forecast promising achievements of science and technology. Here the possibility of changing over to new physical indicators should be envisaged (for example, the production of specific types of sheet products can be systematically planned, depending on the level of technical development of the sector, in units of mass, length, or--for several most advanced products--area). This is due to the fact that as a result of scientific and technical progress the vector of the technical indicators of items tends toward the enlargement of dimensions, while the main technical parameter can change when shifting to the next stage of development. Hence follow the requirements of the increase of the dynamism of the system of statistical accounting.

As to the plans of the modernization and retooling of enterprises, which are drafted within the system of state plans and envisage the improvement of equipment and technology, the organization and management of production, their role is being significantly underestimated, since they are not taken into account when providing enterprises with financial and material resources. Here a positive result can be achieved in case of the changeover of

enterprises to genuine cost accounting and the solution of the problems of the material and technical supply of enterprises, which perform work on the retooling and modernization, as well as the construction of nonproduction facilities, which are carried out on their own at the expense of the assets of the production development fund, the fund for sociocultural measures and housing construction, and bank credits. The corresponding development of the material and technical supply service is necessary for this.

The further improvement of the system of production planning is a condition for the settlement, in our opinion, of the main question: How is one to stimulate the aspiration for the development, introduction, assimilation, production, and use of new equipment and technology?

The Stimulation of the Acceleration of Technical Progress

The problem of the economic stimulation of the production of new equipment and the use of new technology is multidimensional. In this article we will examine only the questions of the improvement of /price levers of stimulation/. Under the conditions of the prevailing economic mechanism the economic stimulation of scientific and technical progress is aimed at the quickest compensation of the increased level of expenditures on the development, introduction, and assimilation of new products and production capacities and presumes mainly the use of incentive measures according to the principle: the validly high expenditures on the assimilation of new equipment and technology should be reimbursed to the manufacturer (by the raising of prices, the increase of material incentive funds, and so on). The existing economic system reacts in precisely that way to scientific and technical progress, which at the stages of research and development, the introduction and assimilation of innovations in practice is always a "load" on the economy, requires additional expenditures (at times significant expenditures), and worsens the indicators of economic development.

In conformity with the prevailing system of pricing the wholesale prices for new products are established on the basis of the standard expenditures with allowance made for the estimated economic efficiency. Here the material incentive fund depends on the volume indicators. Thus, the producer of new equipment under the conditions of his relative independence from the consumer is interested not only in the improvement of the quality and the broadening of the range of items being produced, but also in the increase of the level of the prices, which ensure an increase of the volume of commodity and sold production, the profit, and accordingly the deductions for economic stimulation funds.

In this situation the moderating role of the USSR State Committee for Prices, which found expression in the planned revisions of prices for machine building products (in 1967, 1973, and 1982) and the review of the plans of wholesale prices (in particular, the State Committee for Prices annually approves up to 200,000 prices and rates, including more than 80 percent of the wholesale prices for the products of heavy industry)(9) and so on, is undoubtedly positive. However, the State Committee for Prices is not capable of completely controlling the process of pricing, since it is impossible to calculate in a centralized manner the production cost of all models of new

equipment, to make annual price revisions, and to evaluate the true novelty of items (in 1984 half of the plans of wholesale prices with markups, which were submitted by ministries, pertained to items which differ negligibly in their characteristics from those already assimilated in production).(10)

The existence of two types of price levers of the stimulation of scientific and technical progress--direct and indirect--has already been noted in the article of V. Pokrovskiy.(11) Price markups (reductions)--direct levers of stimulation--promote the expansion of the output of products of increased quality, including advanced types, and the rapid dissemination of new equipment and technology. However, in the absence of a sufficiently rigid connection between the producer of new equipment (technology) and its user the latter is not capable of fully checking product quality. As a result uncontrollable deviations, for example, in the direction of a relative decrease (as compared with the world level) of the technical level of the items being produced, the artificial overstatement during certification of the proportion of products of the highest quality, and so forth are possible. The aspiration to compensate for the increased expenditures on new equipment by changing the production cost of the output, which is produced by means of it, is a natural reaction of the user of new equipment and technology to these deviations. A chain reaction as if occurs: the decrease of the stimulating effect of price levers as a result of the decrease of the producer's profit due to the markups on the prices for the products consumed by him gives rise to his aspiration to compensate for losses by means of additional markups on the price for "an even newer product," which frequently proves to be only a modernized version of the one previously produced.

Under the conditions, when the price reductions for obsolete products, which, it would seem, are a natural means of preventing an increase of prices, do not have the desired effect, it is possible to produce "new" equipment and technology, the indicators of which differ little from the former models. At the June (1986) CPSU Central Committee Plenum it was noted that "the artificial overstating of prices does not cure economic diseases, but only corrupts workers and hinders technical progress. Overstated prices, which are based on the expenditure approach, conceal the shortcomings in the technology and organization of production and give rise to contempt for the search for efficient means of managing the economy."(12)

The changeover of enterprises to genuine cost accounting and the assurance of the decisive role of the user of new equipment and technology through the system of contractual prices, price markups on advanced types of products, and price reductions on obsolete types are a condition of the further improvement of the system of the direct stimulation of scientific and technical progress. Along with the indicated stimuli such stimuli as the maintenance by the producer of new equipment and technology of the achieved positions, the possibility of deriving a stable amount of profit over a quite long period, the increase of the scale of production of new products, the strengthening of the prestige of inventors, scientists, leading specialists, the scientific research institution, and the enterprise (association),(13) and first place in the socialist competition should also have an effect. At the same time the activity of outdated enterprises, which are not capable of producing a product which satisfies present requirements, as well as of scientific research

organizations, if their work does not meet the demands of life, should be halted.

The problems of improving the indirect levers of the stimulation of scientific and technical progress, which are governed by the prevailing system of pricing, the methods of evaluating the efficiency and level of technical development of individual economic objects, and the nature of the relations between the producer and user of new equipment and technology, are no less serious.

The problems of pricing, as has already been noted, are especially complex. The calculation of the prices for new equipment is made on the basis of the estimate of the expenditures on its production. Here the possibility of increasing the production cost as a result of the corresponding calculation of the overhead expenses, the replacement of materials and component assemblies with more expensive ones for the purpose of increasing the volume indicators, and so on is created. The stimuli for the increase of the estimated economic impact and the growth of the volume indicators, that is, stimuli which are aimed at increasing the prices for a new product, have an effect already at the stage of development and designing. It has been established that per unit of the main parameter the specific production cost of the bulk (more than 60 percent of the examined types)(14) of equipment increases more rapidly than the price, moreover, for a large number of machines (for example, diesel engines and diesel generators, caterpillar tractors, generators for steam and gas turbines, and others) the difference in the growth rate of these indicators comes to threefold and more.

It is possible to counteract this by the planning of the reduction of the production cost of products (machines, equipment). However, this step is also not effective enough: there exists, for example, the practice of transferring the production of already assimilated equipment to other enterprises of the sector, where its assimilation is again required and on this basis the product cost can be increased substantially; the removal from production of advanced equipment, which it becomes unprofitable for the enterprise to produce after the exhaustion of all the reserves of the decrease of production costs, although a long-term stable demand for this product exists, is stimulated by the planned reduction of the production cost.

In our opinion, it is necessary /to reject the principle of the complete reimbursement by the user of all the expenditures on research and development, the introduction and assimilation of innovations/. The additional costs should be covered by means of funds, which are formed at the enterprise (association), and in a centralized manner by deductions from the profit and from the output of assimilated products. So that the enterprise (association) would be interested in deductions from the profit for scientific and technical measures, stimuli, which are not based only on an incentive, are needed. /Centralized funds should be formed/ not at the level of the sector (ministry), but /at the level of the national economy or individual region/.

The analysis of the practice of forming and using the Unified Fund for the Development of Science and Technology (YeFRNT) in sectors shows that since the standards of the deductions from the profit for the Unified Fund for the

Development of Science and Technology are established as a percent of the planned volume of production of the commodity or net output, ministries are interested in seeing to it that the actual amount of the Unified Fund for the Development of Science and Technology would conform to the planned amount,(15) that is, in maintaining the amount of the profit of highly profitable enterprises. The simplest means of achieving this goal are, on the one hand, the planning of the output of highly profitable products, which were assimilated long ago, and accordingly the slowing of the dissemination of new equipment and technology and, on the other, the establishment of incentive price markups for new equipment, that is, the increase of the level of prices. We are focusing attention on the Unified Fund for the Development of Science and Technology first of all because its size has achieved a significant amount: in 1984 in 29 industrial ministries alone by means of deductions from the planned profit 4,959,000,000 rubles were channeled into the Unified Fund for the Development of Science and Technology, which comes to 26.6 percent of the amount of all the economic stimulation funds, which were formed by enterprises of industry as a whole, or 63.8 percent of the amount of production development funds.(16)

In light of what has been said the practice of establishing for fundamentally new types of products temporary wholesale prices (which are calculated on the basis of the production cost), which compensate for the production costs with a profitability of 10 to 20 percent, also requires improvement. Fixed prices are established only after the assimilation of the product in production. As practical experience shows, enterprises are in no hurry to get approved in the USSR State Committee for Standards the standard technical specifications for items, which have been recommended for series production, thereby extending the term of effect of the temporary prices. The increase of prices also stems from the practice of the approval by the producing ministry of prices for prototypes (test runs) of a new product and for semifinished products, assemblies, and parts, which are supplied by subordinate enterprises by way of intraministerial cooperation.(17) Thus, of the total number of prevailing wholesale prices ministries and departments and, with their permission, enterprises approve 32 percent.(18) In spite of the fact that consultation with the client (developer, buyer) is required when approving new prices, the role of the producing ministry proves to be decisive. Apparently, it is advisable to introduce in the practice of pricing on the basis of expenditures limitations on the permissible increase of the price per unit of the main parameter.(19)

When setting the price it is not always possible to take into account whether the product is actually new or the production of improved versions of items, which are already being produced, is being assimilated under this guise. Here the increase of the price of the unit power is often stimulated by such directions of scientific and technical progress as electronics and computer technology. The planning of the volume or proportion of output with the Emblem of Quality or consumer goods with the index "N" also leads to an increase of the price. The latter is approved at present by the producer (here the product is considered sold even before its receipt by the actual user). Obviously, /the user or trade should award the Emblem of Quality, which confirms the level of the item, as well as the index "N"/, and not the producer. We also support the suggestion of V. Pokrovskiy that the extensive

dissemination of the practice of announcing competitions for research and development, items, and so on is necessary for the stimulation of the reduction of prices for new equipment and technology.(20)

At present the prices for new equipment are established with allowance made for the estimated economic impact. The incentive markup, which comes to 50 percent of the economic impact (or up to 70 percent, if discoveries and inventions are used in the new model), is also established in conformity with it,(21) moreover, the markup cannot be more than 30 percent of the wholesale price. The indefiniteness of the conditions of establishing the markup, which is also due to the impossibility of an exact calculation of the actual economic impact, simplifies its receipt. The increase of price markups is also stimulated by the fact that 70 percent of their amount enters the economic stimulation funds of enterprises. As a result the additional profit from the price markups as a whole for machine building is increasing and in 1984 exceeded 6 percent of the total profit (as compared with 4.5 percent in 1982), in the Ministry of Power Machine Building its share came accordingly to about 14 percent, in the Ministry of the Electrical Equipment Industry and the Ministry of Chemical and Petroleum Machine Building--approximately 10 percent each.(22)

The use when determining the price for a new item of a criterion, which is oriented toward the estimation of the rated economic impact without regard for its actual amount, which is formed at the user's, can lead to a significant hidden increase of the price of a unit of power of machines and equipment: the lack of a drag of auxiliary machines, an inadequate level of skills of attendants, the failure to observe the operating conditions, the lack of materials and raw materials of the required quality, and an insufficiently high level of the organization of production lead to a decrease of the real output of new equipment as compared with the estimated amount.(23)

Hence follows the conclusion that /one must not use the estimated value of the economic impact from new equipment and technology for the formation of prices/. It should be used by the producer of new items for the evaluation of versions of new development. /A knowledge of the actual amount of the economic impact is required for the purposes of pricing/.

A precise estimate by the producer of the anticipated amount of the economic impact is especially important in case of the rapid development of new equipment and technology, and first of all for the leading directions of scientific and technical progress, such as, for example, the automation of machine building production on the basis of the use of advanced technological processes and flexible production systems (GPS).

This is connected with the high cost of flexible production systems, which comes on the average to 5-6 million rubles,(24) as well as with the possible scale of their dissemination. Suffice it to say that the production and installation, for example, of 2,000 flexible production systems will require expenditures which exceed one-third of the capital investments, which were allocated in 1984 for the modernization and retooling of operating enterprises (with respect to production facilities).(25) The flexible production system is characterized by an automatic mode of operation of the NC equipment, which

is a part of it, robotized technological complexes, flexible production modules, and individual units of production equipment, as well as by the property of automated readjustment in case of the production of items of an arbitrary range within set limits of the values of their parameters. Hence it follows that the efficiency of flexible production systems and the output of equipment, which, as a rule, is higher than that of the equipment being replaced, depend first of all not on the technical indicators of this equipment, but on external conditions--the organization of production at the enterprise and in the sector, the level of specialization and cooperation, as well as on the need for the product, which is produced on it, and so on. The insufficient consideration of this circumstance by the method of evaluating the efficiency of new equipment and technology can lead to the overstatement of the amount of the economic impact when choosing flexible production systems and can develop into significant harm for the national economy.

Thus, when evaluating the efficiency of new equipment and technology it is necessary to take into account, /first/, that the anticipated economic and social impact depends on the need of the enterprise, sector, and national economy for the items being produced by means of the new equipment (technology), as well as on the need of the national economy for the final product, for which they are intended. Therefore, the evaluation of the possible versions of the annual need for items, which are produced by means of the achievement in question of scientific and technical progress, should precede the calculation of the economic impact. /Second/, it should be borne in mind that the direct economic impact in the production section, where the new equipment (technology) is being introduced, depends on the organization of production at the enterprise, the anticipated level of specialization and cooperation, and the supply with material resources, which are necessary for the fulfillment of the annual program, as well as with manpower resources of the required skills for operation and repair. Therefore, a correction coefficient, which takes into account the possible level of the organization of production, should be introduced in the formula of the calculation of the impact. /Third/, when evaluating the additional factors of economy from the introduction of new equipment (technology) it is necessary to take into account the possibilities of attracting highly skilled specialists for its operation and repair (here one should bear in mind not only the expenditures on education and training, but also the shortage of specialists of the corresponding skills), as well as the expenditures, which are required for the training of released workers for a new profession or their job placement. /Fourth/, when estimating the impact (according to the profit) one should take into account the possible decrease of the price for the product being produced with the aid of the new equipment (technology), which is due to the increase of the scale of production.

/The general conclusion/ is that the primary use of levers of stimulation, which are oriented toward a material incentive for the output or use of new equipment or technology, in combination with the methods of planning and financing, which are characteristic of the stage of the building of the socialist economy,(26) does not make it possible at present to ensure the maximum acceleration of scientific and technical progress. "There will be no progress," M.S. Gorbachev emphasized when addressing the conference of the aktiv of the Khabarovsk Kray Party Organization on 31 June 1986, "if we do not

seek answers to the new questions in economics and technology, in the experience of the 1930's, 1940's, 1950's, and even the 1960's and 1970's. Now the times are different, the demands are different, the needs are different, but the possibilities are also different."(27)

The severing of some relations, first of all between the consumer and the producer, the existing imbalance in the system of stimuli, and the primary orientation only toward positive stimuli--price markups, the increase of the material incentive fund and production development fund, and so forth--are leading to the one-sided change of economic indicators and are not conducive to the stable acceleration of scientific and technical progress. The effect of the indicated stimuli is confined to the fact that while poorly working enterprises or separate individuals in practice do not risk anything, the constant effect of levers of encouragement is required. /The lack of economic opportunities for the significant reduction of revenues in case of poor work is at present, in our opinion, one of the most important factors of the slowing of scientific and technical progress and economic development as a whole/.

Thus, the key problem of the acceleration of scientific and technical progress consists, in our opinion, /in the need for the additional use of a group of stimuli, which are characterized by the imposing of sanctions of various kinds/--economic, legal, and others--for the development, production, and use of equipment and technology of a low level. However, the solution of a large number of socioeconomic problems (including the tasks noted above on the reform of the economic mechanism) should precede their imposition.

Socioeconomic Problems of the Acceleration of the Development of Equipment and Technology

The question "that the amount of the wage fund of enterprises would be directly linked with the revenues from the sale of their products"(28) was raised at the 27th CPSU Congress. The need to ensure the influence of the user of a product on its technical level and quality was thereby emphasized. Such influence can be ensured provided that the income of collectives is made directly dependent on the efficiency of their work.

However, a large number of more general problems, without the solution of which, in our opinion, it is impossible to ensure the significant acceleration of scientific and technical progress, arise when realizing the outlined goals. Among them first of all one should single out the problems of the real differentiation of the wage in conformity with the results and quality of the labor of workers; the different provision of enterprises with financial resources and fixed and working capital subject to the indicators of economic activity, which in many respects depend on the state of the technological base and the technical level of the output being produced; the restriction and, in case of insolvency, the halting of the activity of poorly working enterprises with the corresponding transfer of manpower resources; the freeing and retraining of manpower as a result of the automation of production processes and the introduction of robotics and other achievements of scientific and technical progress. The significance of the additional demands, which are being made by scientific and technical progress on the increase of the

mobility of manpower resources in connection with the need for the change of specialty, the increase of skills, and so on, should be specially emphasized.

The solution of the named problems is also aimed at the further strengthening of social justice in the distribution of goods of various kinds. "The strict implementation of the principle of social justice is an important condition of the unity of the people, the political stability of society, and /the dynamism of development/," it was noted at the 27th CPSU Congress.(29) Among the necessary social guarantees of labor activity there are first of all those which are connected with the maintenance of a specific level (perhaps, the minimum level or a level close to it) of the wage, the provision of housing within a specific norm, the right of choice of a job and the place of residence, and so forth. Thus, the planned significant increase of the available housing of the country is indirectly conducive to the increase of the mobility of labor resources, including scientific labor resources; the changeover to hiring on a contract (for a specific period, for the period of the fulfillment of specific assignments) with the imposition of economic sanctions for the failure to fulfill its terms and so forth can contribute to the increase of the responsibility of the worker to the enterprise.

The difficulty of solving the noted problems is visible, in particular, from the example of the assurance of the objectively necessary amount of differentiation of the wage. When solving this problem it is advisable, in our opinion, that not only the conformity of the growth rates of the minimum and average wage would be observed, but, as Academician T.I. Zaslavskaya suggests, the restrictions on the maximum level of the remuneration of highly efficient labor (in combination with the introduction of a progressive income tax) would also be lifted.(30)

The most serious problems are connected with the need for the significant decrease of income for poor, low-quality work, including for the development, production, and use of equipment and technology of a low level. Here, in our opinion, the minimum permissible level of the wage (or the maximum level of its reduction), as well as the degree of responsibility of all workers for poor indicators of the production activity of the enterprise should be specified. It is necessary to formulate regulations of the firing and job placement of workers in case of the closing of an enterprise and the retraining of personnel in case of a forced change of specialty, including in case of the introduction of automation equipment, flexible production systems, and robotics.

The lifting of the restrictions on the maximum level of the wage (and, perhaps, the establishment of preferential conditions of progressive taxation) should be carried out, in our opinion, first of all for people, whose labor is truly creative, since "precisely they are the generators of scientific ideas and developments, the technical level of production first of all depends on them."(31) The rejection of the named restrictions presumes not only the possibility of paying a larger reward for the achievements of science and technology, which are of great national economic importance, but also the establishment, as Academician L.V. Kantorovich proposed, of a higher wage as against the general wage scales at especially economical enterprises of a high technical level.(32)

The chosen problems, which, of course, do not encompass all the questions which are connected with scientific and technical progress, seem most important to us at present, when the cardinal acceleration of scientific and technical progress is regarded by the CPSU as a vital question of its economic strategy. Their solution is possible only on the basis of an integrated systems approach and requires the conducting of the corresponding research in the area of the entire system of social sciences.

FOOTNOTES

* Continuation of the discussion begun in No 9 for 1986.

1. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza" [Materials of the 27th Congress of the Communist Party of the Soviet Union], Moscow, 1986, p 10.
2. See "Materialy Plenuma Tsentralnogo Komiteta KPSS 16 iyunya 1986 goda" [Materials of the CPSU Central Committee Plenum on 16 June 1986], Moscow, 1986, p 31.
3. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 33.
4. See EKONOMICHESKIYE NAUKI, No 9, 1986, p 17.
5. On this see: A.Ye. Varshavskiy, "Nauchno-tekhnicheskiy progress v modelyakh ekonomicheskogo razvitiya" [Scientific and Technical Progress in Models of Economic Development], Moscow, 1984, pp 27-31, 125-126, 174-175.
6. See L.I. Rozenova, "Tsena i novaya tekhnika" [The Price and New Equipment], Moscow, 1985, p 105.
7. See ELEKTRONIKA, No 1, 1985, p 41.
8. See IZVESTIYA, 4 May 1985, p 2.
9. See PRAVDA, 6 September 1985, p 2.
10. See SOTSIALISTICHESKAYA INDUSTRIYA, 21 February 1985, p 2.
11. See V. Pokrovskiy, "Problems of the Stimulation of Scientific and Technical Progress," EKONOMICHESKIYE NAUKI, No 10, 1986, pp 25-30.
12. "Materialy Plenuma Tsentralnogo Komiteta Kommunisticheskoy partii Sovetskogo Soyuza 16 iyunya 1986 goda," p 34.
13. For example, for a scientific research institution, at which basic research is conducted, its high status on a world scale can be a stimulus (see EKONOMICHESKIYE NAUKI, No 10, 1986, p 32).

14. See "Tseny i tsenoobrazuyushchiye faktory" [Prices and Price-Forming Factors], Moscow, 1977, pp 41-53.

15. These assets are used mainly for the performance of scientific research, planning and design, technological, and management work in accordance with the orders of ministries. Thus, in the Ministry of the Electrical Equipment Industry about 80 percent of the unified fund for the development of science and technology was used for these purposes, in the Ministry of Power Machine Building--more than 60 percent (see: V.Ye. Shalimov, "Khozraschetnyy mekhanizm upravleniya tekhnicheskim progressom na predpriyatii" [The Cost Accounting Mechanism of the Managent of Technical Progress at the Enterprise], Moscow, 1981, p 61).

16. See "Nardonoye khozyaystvo SSSR v 1984 g." [The USSR National Economy in 1984], Moscow, 1985, pp 563, 571.

17. Let us indicate the indefiniteness of the very concept of the novelty of an item. It can be demonstrated on the basis of the use during development of an inventor's certificate or an foreign license, as well as by the presence of the item in the plan of new equipment of a ministry. And although the State Committee for Prices approves the range of fundamentally new equipment, the decisive say when determining novelty still belongs to the producing ministry.

18. See PRAVDA, 6 September 1986, p 2.

19. V. Pokrovskiy also proposes to introduce the indicator of the limit labor intensiveness of an item (see EKONOMICHESKIYE NAUKI, No 10, 1986, p 32).

20. See EKONOMICHESKIYE NAUKI, No 10, 1986, p 34.

21. The establishment of the markup subject to the use of inventions, in our opinion, is not indisputable, since in this case the importance of the inventions is not taken into account. Thus, of the 51 inventions, which were used in the design of the TLT-100 skid tractor, 31 apply to components, while of the 20 inventions, which were devised by the developers of the machine, 13 in practice do not influence its technical level (see SOTSIALISTICHESKAYA INDUSTRIYA, 17 May 1986, p 2). Suggestions to certify not only items, but also the inventions, which are used in their design, are being made as an improvement of the system of pricing. It seems that such a step will not lead to the solution of the problem, but will only increase the number of "rounds" of certification.

22. See SOTSIALISTICHESKAYA INDUSTRIYA, 21 February 1985, p 2.

23. Thus, given the lack of a drag of the necessary implements the price for the K-700 and K-701 tractors is becoming unjustified, since in this case the actual efficiency of these machine can be significantly lower, and, consequently, the price of a unit of performance is five- to sixfold greater that the accounting price (on this see: A.Ye. Varshavskiy, "Problems of the Development of the Scientific and Technical Potential," IZVESTIYA AKADEMII NAUK SSSR. SERIYA EKONOMICHESKAYA, No 6, 1983, p 44).

24. See NTR. PROBLEMY I RESHENIYA, No 14, 13-16 December 1985, p 3.

25. Calculated according to "Narodnoye khozyaystvo SSSR v 1984 g.," p 380.

26. See G.Kh. Popov, "Effektivnoye upravleniye" [Efficient Management], Moscow, 1985, pp 306-318.

27. PRAVDA, 2 August 1986, p 2.

28. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 36.

29. Ibid., p 44 (the italics are mine--A.V.).

30. See IZVESTIYA, 18 April 1986, p 2.

31. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 239.

32. See IZVESTIYA, 15 February 1986, p 2.

7807
CSO: 1814/118

SEARCH FOR NEW FORMS OF INTRODUCING SCIENTIFIC ACHIEVEMENTS

Moscow EKONOMICHESKAYA GAZETA in Russian No 7, Feb 87 p 17

[Interview with Corresponding Member of the USSR Academy of Sciences Vladimir Yeliferyevich Nakoryakov, deputy chairman of the Siberian Department of the USSR Academy of Sciences, by an EKONOMICHESKAYA GAZETA correspondent under the rubric "The Yield of the Scientific Potential" (Novosibirsk): "In the Interests of Sectors"; date not specified; first paragraph is EKONOMICHESKAYA GAZETA introduction; capitalized passages published in boldface]

[Text] An EKONOMICHESKAYA GAZETA correspondent talks with Corresponding Member of the USSR Academy of Sciences Vladimir Yeliferyevich Nakoryakov, deputy chairman of the Siberian Department of the USSR Academy of Sciences, about the search for new organizational forms of the introduction of scientific achievements in the national economy.

[Question] Vladimir Yeliferyevich! The Siberian Department of the USSR Academy of Sciences has gained considerable experience in successfully advancing research results into production. How do you evaluate it from the standpoint of the present reorganization? Can it serve as the basis for further accelerating the introduction of scientific developments into practice?

[Answer] Let me say immediately: the problem of reorganizing and accelerating all our work, which was posed by the 27th CPSU Congress, raised quite a few serious questions for academic science. The task of accelerating the pace of the country's socioeconomic development by means of scientific and technical progress had an especially urgent ring for us. And everyone who is involved in one way or another in the interaction of science and production has felt the necessity of substantial reorganization.

If we speak about the institutes and design bureaus of the Siberian Department of the USSR Academy of Sciences, then I should note that all of them have analyzed all over again and critically their previous activity. Why? Above all, in order to find specific points and means of increasing activity and as to determine what each of us must reorganize in our own work and how.

Here we kept in mind, and I would particularly like to talk about this, the increasing role in our times of the basic sciences, the rapid growth in the economy of the developed countries of science-intensive sectors, which cannot be developed in principle without constant scientific "replenishment."

Here it is a question first of all of nuclear power engineering, MHD [magnetohydrodynamic] power engineering, the development of computer hardware, the use of laser and radiation technologies, the use of catalysts, genetic engineering, and other urgent and priority directions, which were assimilated during the past two five-year plans.

At the Siberian Department of the USSR Academy of Sciences the recertification of scientific personnel was carried out and changes were made in the structures of certain institutes precisely from these standpoints of the stimulation of work. At the Thermal Physics Institute, for example, four new laboratories were opened for the stimulation of science-intensive directions in power engineering. Young promising scientists head them, the research themes are directly connected with the needs of the national economy. A number of laboratories have been dissolved here for reasons of the lack of promise of the research.

I must also mention another aspect of the question. Back in 1984 a unique inventory of jobs, which it was possible to offer to the national economy for introduction, was made at the Siberian Department. This was difficult and painstaking work. Speaking frankly, it caused dissatisfaction in the collectives of several institutes. But the goal was achieved: we found out, first, who has what "to their name," and, second, we developed a set of evaluations of the effectiveness of jobs and the forms of their tracking in case of transfer to the national economy. That is, instead of general conversations about introduction as a whole, instead of constant reciprocal claims and complaints about the fact that the new solutions are introduced slowly, we found the answer to a single question: Specifically which of the completed developments is it possible and necessary to introduce?

We also approached from precisely this standpoint the evaluation of the experience gained in the department of integrating science with production and the organizational economic forms of the introduction mechanism. For many years we had followed the practice of concluding long-term (as a rule, for a 5-year period and longer) agreements on cooperation directly with industrial and construction organizations, with agricultural subdivisions and ministries. We dealt a great deal with creating an "introduction belt" and solving the problems of "an outlet to the sector," to its design and technological services and enterprises.

The channel of "the outlet to the sector" via a specific enterprise has served, does serve, and will serve in the future. There are quite a few examples of this.

The Novosibirsk Sibselmash Production Association on the basis of developments of the Computer Center of the Siberian Department has implemented there the Sibir Plant Management Automation System. The ministry adopted it in the sector and is introducing it at other enterprises. For many years our

developments, which have been introduced at the Novosibirsk Aircraft Plant imeni Chkalov and the switch plant, have been disseminated by this means in the sector.

Our department has been cooperating with the Ministry of Nonferrous Metallurgy for 20 years now. A council headed by Academician Ye. Shemyakin coordinates the work. In accordance with a program of interaction the Mining Institute of the Siberian Department and the sectorial VNIPKIgortsvetmet and State Planning and Scientific Research Institute of the Nickel, Cobalt, and Tin Industry and the Zhayrem Mining and Ore Dressing Complex introduced heavy-duty air hammers and impulse-action buckets into practice.

In similar fashion the Siberian Department of the USSR Academy of Sciences is successfully cooperating with more than 15 ministries. Therefore it is not by chance, obviously, that the experience of cooperation of the Siberian Department with industrial enterprises is currently being used by the USSR Academy of Sciences. Today not only are academic institutes actively seeking a way to enterprises, but industry in many cases can no longer conceive of its own life without ties to science. We rightfully consider the city of Novosibirsk as our own proving ground in cooperation. Practically all the institutions of the Novosibirsk Scientific Center have contacts with enterprises of the city and oblast and are performing about 200 research and experimental design jobs in the interests of the region.

[Question] How did the conducted inventory of jobs suitable for introduction end?

[Answer] When it became clear WHAT can be introduced, the question arose of HOW to introduce it. All the major jobs selected for introduction were presented to the USSR State Planning Committee, the State Committee for Science and Technology, the RSFSR Council of Ministers, the RSFSR State Planning Committee, and 62 ministries and departments. Thereby we enlarged the group of organs, which were informed about the essence of the developments and their necessity and effectiveness and eliminated the "taste" approach to them at various levels.

In accordance with the results of this selection the USSR State Planning Committee made the decision to include 32 developments of the Siberian Department in the state plan of the country's socioeconomic development. In all 82 completed jobs were included in sectorial plans and 37 were included in comprehensive goal programs. What does this mean for us? Very much! First of all, we have obtained the legitimate right to speak on an equal basis with the minister and enterprise director. Not to persuade and not to request, but to decide in essence, as it turned out when it was necessary to specify and submit for the approval of ministries specific themes and deadlines of introduction.

In this way first of all developments oriented toward the machine building sector acquired the state of works of state importance. Among them are a special impact tool, automatic laser measuring devices, units for removing burrs from parts, quenching media, high-strength and wear-resistant steels, technologies for strengthening and applying coatings, production automation

equipment and plant management automation systems, and much more. This is a serious contribution of scientists.

We are now constantly adding to our own "inventory book" of developments. The list of innovations proposed for widespread introduction into the national economy during the current five-year plan already includes about 400 critically evaluated and selected topics. We are extensively familiarizing directors of associations and enterprises and workers of ministries with them.

[Question] But, apparently, a "breakthrough" to the USSR State Planning Committee with the themes of ready developments is possible not every day, is it? And how is the mechanism for everyday introduction at the lower levels being adjusted? Are there some new organizational economic forms and structures for a more rapid utilization of scientific developments in practice?

[Answer] Do you know what every scientist, who has completed an applied job or has seen in basic research a specific contribution to practice, dreams about? To get it into the plan! Into the plan of development of the enterprise, its plan on new equipment, the plan on modernization.... Furthermore, that they would know the development in the planning organ of the oblast or kray, in the ministry, and, of course, in the USSR State Planning Committee.

But who should blaze this trail? A great deal depends on how the main sectorial institute looks at the innovation. There are many examples of how a negative attitude of the main institutes of ministries has long delayed the assimilation of even extremely successful academic developments. Therefore, I repeat once again that it is necessary first of all to strengthen the planning principles in the introduction mechanism. They should permeate the entire chain--from the idea to series production.

In order to concentrate scientific forces and material and technical resources on the priority directions of science and technology, the 27th CPSU Congress deemed it necessary to use more extensively new organizational economic structures. The well-known decree on creating interbranch scientific technical complexes (MNTK's) was adopted. One of the first MNTK's in the country, Katalizator, was set up on the basis of the Catalysis Institute of the Siberian Department. The Coordinating Center for Industrial Catalysts of the CEMA Member Countries operates under this institute. The recently established MNTK is thus becoming the leading organization on problems of catalysis of the entire socialist community. The republic technical engineering center for strengthening coatings based on the Strength Physics and Material Science Institute of the Siberian Department of the USSR Academy of Sciences operates in Tomsk. The Siberian Department is also participating in the Biogen MNTK.

We have attempted to combine the interests of the sectors, having created the center of plasma technologies based on developments of the Thermal Physics Institute and the Special Design Bureau of the Ministry of Chemical and Petroleum Machine Building. We were asked the questions: What will this be?

An exhibition? Show rooms and stands? Yes, this too, inasmuch as many years of experience have convinced us that visual demonstration of a development is of enormous importance for its practical implementation. It is precisely here that the initial questions are asked: How does the proposed unit operate, what can it give one enterprise or another? And then come questions of another kind: Is it a laboratory or production unit? If it is a laboratory unit, the interest of experienced workers wanes, if it is a production unit, the interest increases.

The center of plasma technologies offers primarily production units. They are all operational. A plant can select what production needs. It can place an order for the machining (strengthening) of parts. It can also duplicate the unit.

I cannot but mention that the Interdepartmental Commission of the USSR State Planning Committee for Questions of Accelerating the Introduction of Particularly Important Inventions in the National Economy has already shown an example of deciding the fate of specific scientific developments.

Recently ways of using radiation technologies based on industrial electron accelerators, which were developed at the Nuclear Physics Institute of the Siberian Department of the USSR Academy of Sciences, were examined in it. Precisely at this session (for the first time in 20 years!) the interdepartmental bonds were cut, the USSR Ministry of the Electrical Equipment Industry was made responsible for producing the accelerators in Novosibirsk and Moscow. More than 10 ministries should take additional steps on broadening the extent of use of the technologies based on accelerators, while the USSR State Committee on Prices should examine the question of stimulating prices for accelerators and the products obtained by means of them.

Such an approach literally inspired the scientists of the Nuclear Physics Institute, they proceeded to develop a new generation of industrial accelerators. Already during the 12th Five-Year Plan, according to data of the same Interdepartmental Commission, radiation technologies will be able to provide an economic impact of more than 1 billion rubles!

In short, the search for new organizational structures is under way at the Siberian Department of the USSR Academy of Sciences, and I am confident that it will yield its own fruits.

[Question] And how is reorganization going at the academic institutes themselves? What is it aimed at?

[Answer] There is one goal here--to step up appreciably the pace in basic research as the underlying basis of our development and in the high-quality and more effective management of applied work. We consider the conversion to the new system of the remuneration of the labor of scientists to be a powerful lever here. This stage has already been completed at the Siberian Department, the staff members have been certified, the themes have been consolidated, and the long-range directions of work have been provided with resources. Experience of the work of temporary scientific and technical collectives is

being gained. We are linking with them great hopes for the acceleration of developments. Thus, the Start Temporary Scientific Collective, which in just 3 years has to accomplish a most important task--to formulate and check the concept of development of computers of a new generation--is working on the basis of the Computer Center of the Siberian Department of the USSR Academy of Sciences. The work is proceeding successfully.

Finally, our approaches to the personnel support of scientific and technical progress have been revised in many respects. The training of scientific specialists and the retraining of engineers and managers of enterprises in the new directions will proceed, above all, in the interests of industry. At present, practically all the institutions of the Novosibirsk Scientific Center are base ones for Novosibirsk State University and the Novosibirsk Electrical Engineering Institute. Every year here specialists of all sectors of the national economy undergo advanced training in the latest methods of enterprise management with the use of computers, as well as in the problems of improving the economic mechanism and scientific and technical progress.

The scientific institutions of the Siberian Department of the USSR Academy of Sciences in many cities have become the base ones for the computerization of schools. The scientists of the academy campus, who have taken the schools of the Sovetskiy Rayon under their wing, have given a good example. They are participating in equipping the classrooms with computer hardware and are developing software. We treat this seriously, for today's schoolchildren will enter the sphere of production tomorrow.

The search for new organizational economic forms and structures in order to combine science and production continues. We hope very much that it will be of direct benefit to the national economy and will help to more rapidly develop a mechanism of the management of the introduction process.

2384
CSO: 1814/124

TWO VIEWS ON CANCELED WATER PROJECT, WATER RESOURCE PROBLEM

Voropayev Interview

[Interview with Corresponding Member of the USSR Academy of Sciences Grigoriy Vasilyevich Voropayev, director of the Institute of Water Problems of the USSR Academy of Sciences, by NTR: PROBLEMY I RESHENIYA correspondent Ye. Minin under the rubric "The Safety of Progress": "'My Opinion Is: The Project Is to Live....'"; first three paragraphs are NTR: PROBLEMY I RESHENIYA introduction"]

[Text] Since the April (1985) CPSU Central Committee Plenum openness when discussing major national economic projects has become a norm of our life. Precisely at that time a broad discussion over "the imposing project of the century"--the project of diverting the runoff of northern rivers to the south--developed in the pages of newspapers and journals. People of the most different ages and occupations from students to academicians wrote: the outlays of capital are enormous, the impact is questionable, the ecological and economic consequences are poorly predictable.

Public opinion prevailed over the viewpoint of the supporters of diversion. By the decree of the party and government in August 1986 the work on the project was halted. But did the approach of its authors to water resource problems change? What conclusions did they draw from the results of the discussion? In order to get answers to these questions, our correspondent met with Corresponding Member of the USSR Academy of Sciences G.V. Voropayev, director of the Institute of Water Problems of the USSR Academy of Sciences. Several arguments of G.V. Voropayev seemed debatable to us. At the request of the editorial board Candidate of Economic Sciences V.I. Perevedentsev, a member of the USSR Union of Journalists, comments on a portion of them.

We invite specialists to express their opinion on the problems which were touched upon in the interview.

Correspondent: As chance would have it I recently had occasion to attend the general assembly of the staff members of the Institute of Water Problems, where you, Grigoriy Vasilyevich, delivered a report.

We all remember that in August of last year the decree on halting the work on the diversion of the runoff of northern rivers was promulgated. Nevertheless

from your statement I got the impression that the work on the diversion project has only been halted for a while. Did I understand you correctly?

G.V. Voropayev: It is true that the decree of 14 August 1986 is called "On the Halting of the Work on the Diversion of a Portion of the Runoff of Northern and Siberian Rivers," but in its serious part it is written: "...to exclude from the plans for 1986-1990 the assignments on the fulfillment of the indicated work." Not from the long-range plans! The second thing is: "The councils of ministers of the union republics...are to achieve a decrease of water consumption...by 15-20 percent."

Further it is recorded: "The State Committee for Science and Technology, the USSR Academy of Sciences, and the All-Union Academy of Agricultural Sciences imeni V.I. Lenin are to continue the study of the problems connected with the regional redistribution of water resources on the basis of comprehensive economic and ecological research...." Hence, to continue and intensify...! If the problem had been cut off permanently, why continue the work and spend capital? But it is written "to continue," for there will be other plans after the plans of 1986-1990.

There is a third thing. In the decree there is another entry--about the need for the preparation of a report on the development of the productive forces of Central Asia and Kazakhstan with allowance made for the forming demographic and water resource situation in this region. The deadline is the first quarter of 1987.

To what does this testify? To the fact that one must not interpret the decree as an order on the cutting off of all work on diversion. In short, my opinion is: the project is to live.

And, finally, on the essence of the problem. In our country over 60 cubic kilometers of water a year are redistributed between river basins of different regions. We could not survive today without this. For example, how is one to imagine the Crimea without the Northern Crimean Canal? The population in recent years has increased there by several fold. The need for agricultural products, of course, has also increased. But nevertheless the population and vacationers are supplied rather well with vegetables and fruits. This became possible only owing to the canal. But in capacity it is only half as great as the canal of Siberian diversion.

Correspondent: But there is also the example of the Karakumy Canal, along the banks of which cane, in which wolves and boars have bred, has grown on vast areas.

G.V.: The Karakumy Canal has peculiarities as compared with other canals. They built it when there was not much equipment and, therefore, they chose the most inexpensive version.

It was built in barhan sands. They percolate, especially at first, mercilessly. The grounds waters occur very deep and do not restrict percolation. Not by chance during the first years of construction (about 30 years ago) was much said about the fact that water would not run at all.

Now over the entire length of the canal about 20 percent of the water is lost. For such conditions this is an excellent result.

I dealt for 16 years with the use of water in Central Asia. Indeed, the coefficients of its effective there are quite low.

Correspondent: About 30 percent?

G.V.: No, this figure characterizes only individual systems. As a whole it is possible to say that half the water is used.

Correspondent: Is there a reserve of the increase of this indicator?

G.V.: There is. But there is also one catch. The point is that the soils of Central Asia are saline. Approximately half of the land has an increased content of readily soluble salts, and when moisture is supplied these salts dissolve and together with the water upon its evaporation are drawn to the surface. Science has learned to combat it. First, there is the collecting and drainage network and the increase of the rates of water consumption for leaching work. Different methods are used subject to the composition of salinization, its rate, and the depth of occurrence of saline rocks. Their point reduces to one thing--it is possible to remove the salt from the soil only by water. There is used for this 20-50 percent of the water with respect to the water which is needed for the cultivation of agricultural crops. And there is no way to escape this.

Correspondent: Do you believe that 50 percent is the maximum possible utilization factor of water?

G.V.: No. Approximately half of the land is land which needs leaching operations. On the remaining territories so-called automorphic irrigation without leaching work is possible. Here it is possible to consume exactly as much water as is needed for cultivating agricultural crops. The quality of leaching work also depends on the technique of irrigation and drainage and the condition of the fields. Today the average rate for Central Asia is about 11,000 cubic meters per hectare. Potential means to reduce water consumption to the physiological need, which is equal to 6,000-7,000 cubic meters per hectare, exist.

Correspondent: Will this be expensive?

G.V.: Very expensive. In some cases water is lost during transportation to percolation. We have learned to combat this: linings, chutes. Improvement will be accomplished gradually. For the current five-year plan it is planned to completely modernize the irrigating systems on an area of 5.6 million hectares. Such amounts of work did not exist during any of the past five-year plans. At that time there were only new increases. The expenditures on modernization in many cases were less than those of new construction, if you keep in mind not only reclamation expenditures.

Correspondent: When water is mineralized to the limit, where do they send it?

G.V.: To so-called evaporators. Under the conditions of the arid zone this is simple: there are always many depressions, there is plenty of land. Such a method is very economical.

Correspondent: Is that why in our country waters were also discharged into the Sarykamysh Basin and the Aydarkul?

G.V.: Quite correct. But they were in a hurry. And it would have been better to discharge it not in these internal drainage basins, but into the Aral Sea, to keep it from becoming extinct.

Correspondent: I remember your recent statement that the Aral Sea is a mistake of nature. How is it possible to understand it?

G.V.: These are not my words. Academician Voyeykov said that, having seen the Aral Sea. But this sea is indeed a mistake of nature. A desert. Conditions, which are terribly unpleasant for man, are around. It is difficult to work there, and even more so to live there. It is difficult to understand the people who live there. The only comfort is fish.

Correspondent: But now in the Sarykamysh there are more fish than in the Aral Sea.

G.V.: I would not recommend this fish.

Correspondent: But if the sea dries up, will the conditions deteriorate even more?

G.V.: In the lower reaches of the Amu Darya River, in Karakalpakia the conditions are closely linked with the level of the sea. With the receding of the sea the climate here will become more continental, the hydrological conditions and the level of ground waters will also change. It decreases, and the fields remain without replenishment.

Correspondent: But what all the same is to be understood by the term "a mistake of nature"? The same Aral Sea--if it emerged, hence, this was due to some reasons. Life, which will disappear together with the sea, is going on in it and around it. It is necessary to preserve and study it.

G.V.: Thus we will come to the existence of forces of the other world, which establish the purposefulness of nature. It is necessary to compare nature with the needs of man. He lives by means of nature, on its resources. The more developed society is, the more efficiently it uses nature. But we must cease to treat lakes and rivers as storage sites of all kinds of waste.

Correspondent: Does our main reserve of water conservation perhaps also lie in keeping bodies of water clean?

G.V.: Quite correct. If, imagine, our bodies of water had not been polluted for decades, there would also be no problem of water resources.

Correspondent: Water in Central Asia, as is known, is used mainly for the irrigation of cotton. Is it perhaps possible to reduce its area by the use of highly productive strains and an intensive technology of cultivation?

G.V.: Unquestionably. Cotton has actually become for Central Asia a one-crop system, although with respect to technology its share in the crop rotation should not exceed 40-60 percent. The remainder should be given to grasses or other associated crops. Otherwise soil fertility decreases, extra expenditures on fertilizers and, what is the primary thing, huge expenditures on the control of pests, which actively develop on the cotton plant, are required. Many diseases also accompany it. Therefore, the most reasonable route is to introduce crop rotations. But this will require in case of the maintenance of the amount of obtained cotton an increase of the irrigated areas.

It is possible, of course, to reduce cotton production and on the freed areas to sow grass for fodder for cattle. Animal husbandry is good, because foodstuffs are delivered to these regions: the population itself provides only a third of its own food. This is irrational behavior and wastefulness from the standpoint of the economy of the country. It must be the other way round: to decrease the areas under cotton, by means of selection to increase the yield, and to put the free lands into the production of agricultural products, which are characteristic of these regions and are most profitable from the standpoint of the all-union division of labor. It is necessary to export vegetables and fruits from here. And not to pose the task of moving people from here. This is socially incorrect.

In Central Asia the longing for the land has remained. Is this really bad? Our Nonchernozem Zone was left without people. In Kalinin Oblast, for example, there are about 1,000 population centers, in which there is no longer one able-bodied person. In the RSFSR 4 million hectares of cultivated land have become overgrown with brush in the past decade alone.

Correspondent: And in the same Kalinin Oblast swamps are being rapidly drained....

G.V.: In Central Asia the biopotential is six- to sevenfold greater than for the country. But we are beginning to grow tomatoes on Chukotskiy Peninsula and in Norilsk. They are bringing in solar oil by the barrels on helicopters, are lowering lakes, are mowing grass, are storing it, are setting up a hothouse farm, and are driving cattle into it. In the end they obtain meat, which in production cost is six- to twelvefold more expensive than delivered meat. As a result lakes are being lost and the tundra has been strewn with solar oil barrels and eaten away by machines.

Correspondent: When settling all these question should one probably evaluate and compare all the factors and think in alternative ways?

G.V.: Pardon me, in history there are events that do not depend on you and me.

After the war it was necessary to restore the economy. Where was one to get, for example, electric power? It was terribly difficult to build thermal electric power plants. For this it was necessary to develop turbine building and boiler making and to build mines. The strip mining of coal did not exist during those times. Hence, the most acceptable version is water resources. Although it is also difficult to build a hydroelectric power plant, here there are mainly earth moving and concrete operations, which can be accomplished more rapidly. They built plants on the Volga and Dnieper. By means of them they covered the shortage of power.

Correspondent: Now, when we can choose the type of electric power plant and know how to build, why the construction of, for example, the Chebosarskaya GES and the cascade on the Katun River being started? For there in the Altay Mountains the floods of large areas threatens the existence of an entire nationality.

G.V.: No, no, no. Nothing is disappearing there. These are all fantasies. Unfortunately, our press in the past 2-3 years years has published very many fantastic reports about what is disappearing where and when due to water construction. The fantasy of writers has run so much that simply gems are appearing. For example, the picture, in which the towers and upper parts of the structures of the Kirillo-Belozerskiy Monastery, the Solovetskiy Monastery, and so on stick out from under the water. Much is being exaggerated. There have been, are, and will be no floods and any significant climate changes, which are connected, in particular, with diversion. All this is fictitious and hypertrophied. Then they took a look, but the readers had already been misled. Campaigns have often emerged in our country. It was also launched in defense of nature, and many people lost the sense of moderation.

Correspondent: Perhaps, the excesses in the defense of nature are not as strange as the excesses in its reorganization?

G.V.: No, I do not believe so. This is a most profound mistake. It is necessary, no doubt, to speak about our shortcomings and mistakes in the past. But it is very dangerous to take the path of a complete taboo--one must not do anything, one must not touch anything. For today people often even do not see the causes, and they focus all attention on the consequences. Reclamation measures by their nature are ecologically the cleanest. But people have seen evil in them.

Correspondent: These measures probably also have their own reverse side. When a swamp forms on chernozem, it is difficult to rate this positively.

G.V.: This information is entirely incorrect. I know very prominent scientists, who work at the All-Union Academy of Agricultural Sciences imeni V.I. Lenin and who are dealing with the questions of chernozems. Chernozems, as they testify, lose their fertility. But not in connection with reclamation measures. Of the chernozems that we have only 3-5 percent are irrigated. And what about the remaining 95-97 percent? These are boghara lands. Why have they lost fertility? Not due to irrigation, but in connection with improper cultivation. The same scientists assert that the main means of returning the

fertility of chernozems is irrigation. Of course, competent irrigation. It is possible to turn any actions into hard. Even plowing.

Correspondent: What do you think, can the changeover of enterprises of self-supporting production [samookupayemost] and the introduction of a fee for water use have a positive influence on the saving of water resources?

G.V.: More than a quarter century ago I wrote that it is necessary to introduce a fee for water use. Together with colleagues I even formulated a set of measures. All resources in the country should be charged for. An evaluation of the resources themselves for proper accounting and planning is, of course, also necessary. This problem is very complicated and is most closely connected with the economy of the country. For with the establishment of prices for water we should revise the prices for agricultural and industrial goods. But from here the chain will also stretch to the wage, retirement security, and so on. There is nowhere to get away from this.

Perevedentsev Comments

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 5, 3-16 Mar 87 p 5

[Article by Candidate of Economics Sciences V.I. Perevedentsev, member of the USSR Union of Journalists, under the rubric "The Safety of Progress": "Water, Science, and...Ethics"]

[Text] While dealing with the problems of the sociodemographic development of Central Asia, I inevitably should have come across the problem of water as an important one for all aspects of the development of the Central Asian republics. I will not conceal the fact that, while knowing the problem mainly "as viewed from Central Asia" and receiving one-sided information, I was rather a supporter than an opponent of the delivery there of Siberian water. But in the fall of 1979 I attended an all-union conference on the problems of diversion, which was held in Novosibirsk. It struck me by the "opposition" of workers of the Ministry of Land Reclamation and Water Resources and the All-Union State Planning, Surveying, and Scientific Research Institute of Water Management Construction, on the one hand, and "independent" scientists, on the other. It became clear to me that here almost nothing was yet clear, that the problem had not been studied scientifically, and that the supporters of diversion were using "strong-arm" techniques. Having returned to Moscow and studied thoroughly the sources accessible to me, I wrote at the end of the same 1979 an article for the newspaper. It was published in March 1982, nearly 2.5 years after being written. I confess--I underestimated the words of Igor Andreyevich Gerardi, chief engineer of Siberia-Aral Sea Canal, which were said to me in Novosibirsk: "But we will not let you discuss the project." My subsequent articles, which were written on the orders of several journals, did not see the light.

I am also now ready, having incomparably more information, to defend the three main theses of that old article:

--the problem has not been studied scientifically, the designing operations do not have a scientific basis;

--there are no proofs of the economic efficiency of the canal, the assertions about recoupment in 10 years are grossly incorrect;

--before hauling Siberian water 2,500 versts, it is necessary to establish order in the use of local water.

Then while taking part in the examination of the feasibility studies of the diversion of a portion of the runoff of northern rivers to the Volga, I was astonished by the enormously low scientific level of these studies. To the credit of the expert commission, it rejected these feasibility studies. The general resolution was as follows: "to return the feasibility studies for revision." But 17 experts--exactly a third of the entire expert commission--headed by Academician D.S. Likhachev wrote a separate opinion: "to reject the project in principle." Before the revision of the feasibility study and its legal approval subsequent operations should have been halted. This, however, as far as I known, did not happen. The Ministry of Land Reclamation and Water Resources wanted to get its own way--"by hook or by crook." And it did this, unfortunately, with the full support of the Institute of Water Problems of the USSR Academy of Sciences. I am inclined to believe that now the problem of the diversion of water of Siberian waters to the Volga has been "closed" completely. The country incurred great losses, which also might not have existed, if the affairs connected with this diversion had be conducted openly, if openness had been ensured. The lack of openness, as the reader sees, is ruinous.

But with Central Asia the situation is more complicated. Serious scientific research, which is conducted by institutions, which are independent of the Ministry of Land Reclamation and Water Resources, departmentalism, and regionalism, is needed. I am inclined to believe that it will produce the following result: the national economy of Central Asia and Kazakhstan can for a long time yet be developed successfully on local waters; for this it is necessary to improve drastically the use of water.

The problems of the better use of local waters and the supply of the local population with work are topical and urgent. I will note that the assertion that the arrival of Siberian water will make it possible to additionally employ in agriculture millions of hands, was one of the main conclusions of the supporters of the quickest construction of the Siberia-Aral Sea Canal. In my opinion, this is a very strange assertion. In the villages of Central Asia the surplus of manpower resources is so great that given any efficient development of agriculture an increase of employment in it is impossible in case of any expansion of the irrigated areas.

How is one to employ the rapidly growth able-bodied population of Central Asia? This problem is big and very complicated. In Central Asia the "population explosion" is continuing. Whereas for the country as a whole in practice there will be no increase of the population of able-bodied age by the end of the century, in Central Asia the increase will be enormous, the largest in its entire history, more--absolutely!--than for the country as a whole. The only possible means of efficient development is the industrialization and urbanization of Central Asia. This implies, in particular, the establishment

of a large number of new workplaces in labor-consuming sectors of industry: light and food industry, instrument making, electrical engineering, electronics, and so on, as well as in other nonagricultural sectors of physical production and in the nonproduction sphere.

I believe that the republics of Central Asia do not have any alternative to industrialization and urbanization. In any case, no one has even indicated it, if you do not count the already noted, in my opinion, absurd, idea--to employ new millions of people in agriculture.

There is not any close connection between Siberian water and the supply of the population with work, if you speak about the republics as a whole.

Now about water itself.

The average annual surface runoff amounts in Central Asia to 127 cubic kilometers. This is not that little. Moreover, there are ground waters, return waters, and so on. However, no two years are alike. There are dry years, when in many places there is a severe lack of irrigation water (and the lion's share of the water is used namely for irrigation), but there are, on the other hand, also wet years, when one has to "dump" water into depressions of various kinds and to get rid of its surplus. Here is the first, large, and long known possible reserve of water for dry years--the regulation of the runoff between years. Large reservoirs in the mountains are needed for this. For the present this regulation between years does not exist on the largest rivers of Central Asia. But it could--according to published estimates--provide for dry years about 25 cubic kilometers of water, that is, more than the first section of the Ob-Amu Darya Canal would give, if it were completed.

At one time there were created in Central Asia many large reservoirs on hot piedmont plains, which uselessly evaporate an enormous amount of moisture. I suppose that several of them should be eliminated. For example, the Kayrak-Kumskoye reservoir. Its area is 500 square kilometers, that is, 50,000 hectares. It would be possible to irrigate a significantly larger area with the lost water. I will note that in Tajikistan, on the territory of which the Kayrak-Kumskoye reservoir is located, there are only 653,000 hectares of irrigated lands. While the hydroelectric power plant on the reservoir is rather small.

Further there is the metering of water. For the present there is no fee for water, it is difficult to speak of its serious metering at farms.

To establish a fee for water is a powerful lever of the saving of irrigation water. Water in Central Asia is quite expensive. According to the information I have, its production cost is 4 kopecks per cubic meter. The 10,000 cubic meters poured on a hectare spend 400 rubles' worth of it, and 15,000 hectares--600 rubles' worth. If the expenditures on water are linked with wages, both water meters will appear and metering will be set up. I am glad that the director of the Institute of Water Problems of the USSR Academy of Sciences is for charging for water, but I simply cannot agree with him that the introduction of a fee for water is that difficult. A change of purchase prices at farms does not at all necessarily involve a change of retail prices

for goods. There is no point in theorizing in this regard--it is sufficient to cite the example of meat, the purchase prices for which increased greatly, without have affected retail prices.

And, finally, the last thing in number, but not in importance--new advanced economical methods of irrigation. For the present furrow flooding rules undivided in Central Asia. Given it the bulk of the moisture evaporates from the surface of the land, a portion soaks down, and a portion runs off. A negligible portion of the water, which has arrived at the field, is used for respiration, that is, evaporation by the plant, and for the creation of vegetative mass. But there are also other methods of irrigation.

Several years ago at the section of new irrigation methods of the Tajik Affiliate of the All-Union Scientific Research Institute of Hydraulic Engineering and Reclamation on an area of 3 hectares (that is, on a "semi-industrial" scale) 80 quintals of raw cotton were obtained per hectare (the average yield for the republic is 30 quintals), while less than half as much water as usual were consumer per hectare, that is, approximately one-sixth as much water as usual was consumed per ton of output. So-called subsurface irrigation, in case of which irrigation water is delivered through polyethylene pipes, but enters the soil in the form of steam, which in practice is completely taken in by the root system of the plant being cultivated, yielded such amazing results.

There are, of course, also other methods of saving irrigation water, the technology and economics of which will also not stand still.

Practical work on the diversion of Siberian water to Central Asia was not started. That is, there were no direct unproductive expenditures, as in the case with northern rivers and the Volga. However, one must not think that there were no losses. The reclamation work in Central Asia was carried out in expectation of the forthcoming receipt of Siberian water. Many times I had occasion to hear: "now Siberian water will be coming...." The excessive consumption of the waters of the Syr Darya and Amu Darya in the upper reaches and the middle course placed in an extremely difficult position the lower reaches of these rivers, Karakalpakia, and Kzyl-Orda Oblast of Kazakhstan, to which Siberian water should have come first of all. So that the scientific and design mistakes were were expensive.

It is necessary to learn all possible lessons from the incident with "the turn of rivers." Sectorial secrets, departmental interests, and collective egotism cost our society too much.

7807
CSO: 1814/125

ECONOMIC PROBLEMS OF ACCELERATING S&T PROGRESS

Moscow EKONOMICHESKIYE NAUKI in Russian No 9, Sep 86 pp 16-26

[Article by Doctor of Economic Sciences Professor L. Logvinov under the rubric "The Exchange of Opinions": "Economic Problems of the Acceleration of Scientific and Technical Progress"; first two paragraphs are EKONOMICHESKIYE NAUKI introduction; passages within slantlines published in italics; first in a series of articles]

[Text] The editorial board intends to begin the extensive discussion of the economic problems of the acceleration of scientific and technical progress, having focused attention mainly on the following questions: the development of the terminological unity of the concepts "scientific and technical progress," "technical progress," "the scientific and technical revolution"; what the essence and basic traits, the time horizon of the scientific and technical revolution, which make it possible to distinguish it in the course of scientific and technical progress, are; in what the essence of the process of the unification of the scientific and technical revolution with the advantages of socialism, its means, forms, and methods consist; what the mechanism of the interconnection of the development of science and technology and the improvement of socialist production relations is; what the socioeconomic factors of the acceleration of scientific and technical progress are; by what the effectiveness of measures on the introduction of scientific and technical progress can be ensured; how to determine the impact from the introduction of scientific and technical progress at various levels of management and how this impact should be distributed between the users and producers of new equipment and new types of products; what the forms, indicators, and results of the influence of scientific and technical progress on production intensification are; in what the new technical modernization of the national economy consists; how to achieve the development of an effective system of the stimulation of the acceleration of scientific and technical progress, to ensure the conformity of the output being produced to the highest world levels; what levers (direct, directive planning assignments; pricing; payments to the budget; the remuneration of labor) should be used in this direction and to what degree; what role VUZ science can and should play in the acceleration of scientific and technical progress (the organizational forms of participation in the realization of scientific and technical progress); the means of including the scientific potential of higher educational institutions in the system of the planning of measures on scientific and technical progress

at the levels of regions and sectors of the national economy; by what means VUZ developments are to be financed, how the return of VUZ science is to be measured; what the role of political economy is in the accomplishment of urgent tasks of the acceleration of scientific and technical progress.

The editorial board invites everyone who desires to take part in the discussion, by sending in articles no later than 1 January 1987. Only a portion of the problems named here are touched upon in the article of L. Logvinov, which is published below.

Since the late 1960's and early 1970's the problems of the present scientific and technical revolution and scientific and technical progress have begun more and more to attract the attention of Soviet social scientists. And this is also understandable. For precisely the use of the achievements of scientific and technical progress (NTP) in practice makes it possible to raise the solution of many economic and social problems to a new level.

The work on the use of the achievements of scientific and technical progress in the national economy of our country has been under way for more than a decade. But the party posed the task of accelerating scientific and technical progress in an especially pointed way at its 27th congress. In the Resolution on the Policy Report of the CPSU Central Committee to the Congress it is noted: "As the main lever of the intensification of the national economy the party is suggesting the cardinal acceleration of scientific and technical progress and the extensive introduction of equipment of new generations and fundamentally new technologies, which ensure the greatest productivity and efficiency. The congress is placing in the forefront the task to accomplish the thorough technical modernization of the national economy on the basis of the most advanced achievements of science and technology."(1) This policy was continued and developed during the period, which has already passed since the 27th party congress. Delivering the report at the June (1986) CPSU Central Committee Plenum, Comrade M.S. Gorbachev indicated that "a special role is being assigned to the 12th Five-Year Plan. The pace of socioeconomic development and the level of well-being of the people will depend on what kind of foundation we lay during these years for the accomplishment of radical changes in the national economy and /the acceleration of scientific and technical progress/."(2)

While delivering a speech at the solemn meeting, which was devoted to the presentation of the Order of Lenin to the city of Vladivostok, Comrade M.S. Gorbachev noted: "Now we have a detailed program of actions on the acceleration of the socioeconomic development of the country for the long-range future. Such a program, which takes into account both our own aspirations and the most important trends of world development. There is also the necessary detailing of this program--the State Plan for the 12th Five-Year Plan, which was drafted during the thorough analysis of the state of affairs and the search for reserves, means, and methods of the dynamic development of Soviet society." The implementation of this plan, as is known, is based to a decisive extent on comprehensive scientific and technical progress, which encompasses all areas of the national economy.

The urgency and significance of the acceleration of scientific and technical progress require the theoretical consideration of a number of political economic problems, which are connected with its accomplishment. This is especially necessary because themes, in which the revelation of the laws of scientific and technical progress is specially envisaged, have appeared in the draft of the new curriculum of political economy for higher educational institutions, in particular, in the 300-hour curriculum--the name of the theme includes "The Acceleration of Scientific and Technical Progress," and in the 140-hour curriculum--"The Economic Laws of Scientific and Technical Progress."

So far we are unable to find in textbooks a statement in systematized and generalized form of the political economic problems of scientific and technical progress. Such material is disbursed today among numerous monographs, pamphlets, and articles. Here nearly every one usually gives its own, special interpretation of the same concepts, as a result of which there turns out to be a different characterization of the same phenomena or, on the contrary, the identical interpretation of far from identical phenomena and processes in the area of scientific and technical progress. Therefore, it seems to us, the need has arisen first of all for the development of terminological unity when defining such concepts as scientific and technical "progress," "revolution," and "evolution." It is also necessary to specify more clearly the role of science and advanced technical know-how in the acceleration of scientific and technical progress, to attempt to formulate the theoretical basis of effective economic measures on the introduction of the achievements of scientific and technical progress in the national economy; to develop more effective forms of the stimulation of the acceleration of scientific and technical progress; to reveal the forms of influence of scientific and technical progress on production intensification, to specify the indicators, from which it is possible to judge objectively the results of this influence. Thus, a large number of very difficult scientific problems have to be solved.

The term "the scientific and technical revolution" recently was still used quite often as a synonym of another term--"modern scientific and technical progress." It was assumed that scientific and technical progress under present conditions appears as a scientific and technical revolution. The very term "the scientific and technical revolution," as far as we know, appeared for the first time in the book of J. Bernal "World Without War."(3) And although today it is clear that the scientific and technical revolution is only one of the forms of scientific and technical progress (evolution in equipment and production technology is its other form), the disputes regarding the definition of the essence of the scientific and technical revolution and its characteristic traits thus far have not ceased.

The essence of the scientific and technical revolution, if we attempt to systematize the most typical statements of Soviet economists, sociologists, and philosophers on this question,(4) consists:

--in the performance of the logical functions of the producer by a machine (B. Kedrov);

--in the qualitative change of the tools of labor (A. Arakelyan, A. Omarov);

--in the inseparable unity of the fundamental changes in science and technology and the extensive use of the qualitative changes in the system of modern scientific knowledge (A. Kudryashov);

--in a revolution in science, which is at the same time a revolution, which has been carried out by science on the scale of the entire "science-technology" system (Yu. Meleshchenko);

--in the transformation of production and technology and the transition as a result of this to naturally occurring processes which do not depend on man (A. Zvorykin);

--in a qualitative leap in the knowledge of nature and the use by mankind of its laws, which is characterized by the transformation of science into an immediate productive force of society and a subsequent radical change in the entire system of productive forces (G. Volkov, Yu. Sheynin).

A number of economists believe that the essence of the scientific and technical revolution consists in the increase of the role of science in the development of social production and its organization, in its greater and greater transformation into an immediate productive force of society, and in the intensification of the interaction of science and technology.(5)

V.A. Zhamin and I.M. Vladimirova see the essence of the scientific and technical revolution in the unified process which occurs in science and in fundamental connection with its development--in technology.(6) But in the opinion of N.P. Ivanov, "the scientific and technical revolution is characterized by the fact that the process of the revolutionary reorganization of production under the influence of science has turned into a continuous process and has extended to all areas of the economy."(7)

In "Ekonomicheskaya entsiklopediya" [An Economic Encyclopedia] we read: "The scientific and technical revolution is the radical transformation of productive forces on the basis of the use in physical production of new scientific principles, the transition to a qualitatively new stage of the development of large-scale mechanized production, the transformation of science into an immediate productive force of society. It appears as a modern form of scientific and technical progress."(8)

The cited definitions of the scientific and technical revolution suffer, in our opinion, not only from the excessively great "variation" of the attributes, which are taken as criterional attributes, but also from another common essential shortcoming: for all this they are incomplete. Another shortcoming of these definitions lies in the fact that the development of science acts in them as a criterion of the scientific and technical revolution. But the progress of science in itself cannot yield an economic impact. /Not the achievements of science in themselves, but their effective technological application in production is the essence of scientific and technical progress/. Here one should hardly prove that scientific, technical, and social progress, although interconnected, are independent processes. F. Engels noted this circumstance in "Anti-Duhring."(9)

On the basis of the very content of the terms, /scientific progress, or progress in science, is the obtaining of new knowledge about the laws of the development of nature, society, thinking, and man himself. Technical progress, or the progress of technology, is the development and application of new types of technologies and equipment/. Under certain conditions technical progress can also be accomplished on the basis of empirical experience and observations. But such a moment comes in the development of production, when cardinal changes in its equipment and technology can occur only /on the basis of the technological application of scientific knowledge/. When in production "practical problems, which can be solved only scientifically, are posed for the first time,"(10) /scientific and technical progress begins/.

Science and technology began to draw closer for the first time on an extensive scale in the 16th-18th centuries, but their interconnection finally formed starting at the end of the 18th century, when the development of mechanized production required the theoretical substantiation and experimental verification of the correctness of the solution of the practical problems of the development of production.

The merging of science and technology in the common course of scientific and technical progress does not eliminate the independent realization of the progress of science and technical progress.

What criteria can be made the basis for the characterization of scientific and technical progress and in what forms do they appear? These criteria can be different depending on the approach to the determination of the impact of scientific and technical progress. For example, it is possible to examine the technical level of production from the standpoint of the technical equipment of labor, by using such indicators as the capital-worker ratio or the value of a workplace, but it is possible to examine it from the standpoint of the novelty of the equipment or technology being used. However, both indicators are very relative: in the former case an increase of the capital-worker ratio, as well as the price of a workplace and as a result an increase of the prices for the equipment being used can occur, although the technical parameters in production remain unchanged; in the latter case the use of new equipment or production technology far from always leads to an increase of its efficiency. At the same time it is well known that for the national economy the main thing lies not in the novelty of the equipment or technology being used as such, but in the economic impact which it provides.

Finally, it is possible to use such an indicator as the increase of labor productivity or the output per worker. However, this indicator also has only relative reliability. For the application of new equipment and technology, as a rule, leads to the output of new items, which have qualitatively new characteristics and are sold at different prices than products of former years.

In this connection it is not out of place to recall that to this day the adjusted expenditures are the basis for the practical determination of the economic impact from the introduction and application of new equipment. The economic impact in this case is calculated as the difference between the

adjusted expenditures on the equipment being used (the base equipment) and the equipment being introduced (the new equipment). There is based precisely on this the calculation according to the formula

$$Э = З_1 \cdot \frac{B_2}{B_1} \cdot \frac{P_1+E_н}{P_2+E_н} + \frac{(И_1'-И_2')-E_н(K_2'-K_1')}{P_2+E_н} - З_2,$$

where $З_1$, $З_2$ are the adjusted expenditures of a unit of respectively base and new equipment; B_1, B_2 are the annual production volumes of output which is produced by a unit of base and new equipment; P_1, P_2 are the proportions of the deductions from the balance sheet value for the renovation of the base and new equipment; K_1', K_2' are the associated capital investments of the consumer in case of the use of the base and new equipment in terms of the volume of output which was produced on the new equipment; $И_1'$, $И_2'$ are the direct annual costs of the consumer with respect to the operation of respectively the base and new equipment in terms of the volume of output which was produced on the new equipment; $E_н$ is the standard coefficient of comparative efficiency.

The cited method of determining the economic efficiency of new equipment was approved back in 1977, that is, nearly 10 years ago. During this time it has been criticized many times for the errors that exist in it. Several years ago Academician T. Khachaturov even wrote that "given such mistakes it is actually impossible to use this method."(11) Nevertheless it is being used to this day.

Under the conditions of the mass updating of equipment and the introduction of new technologies the urgent need for new approaches to the evaluation of the efficiency of new equipment and technology has obviously arisen.

It seems that /the indicator of the decrease of the power-output ratio of the product being produced and, in most general form, the decrease of the power-output ratio of the final product or the national income is the most effective criterion of the realization of scientific and technical progress and its efficiency/. Here, of course, both the final product and the national income should be calculated in constant prices.

The rate of the decrease of the power-output ratio of the product being produced will show in what form in the given specific case scientific and technical progress is realized: in the form of a scientific and technical revolution (/a radical qualitative leap/ in the equipment or production technology, which is being used in some sector or production process) or in the form of a technical revolution (that is, /the gradual improvement/ of the equipment or technologies, which are being used in production).

An argument in favor of the criterion being proposed here is the fact that in most general form the creation of a useful result in the form of a product or service is the goal of any production, the expenditures of a specific amount of energy always serve as a means for this. It is possible to day that man in production always uses one of the most fundamental laws of nature--the conversion of matter into energy, the conversion of energy into matter. The specific forms of energy expenditures, just as the specific forms of the product being produced, are always different, but the essence of their internal connection in production is always the same.

Even if we imagine production, in which man works without the aid of machines and devices, without the use of any types of energy, in this case his work in the physiological sense is nothing but expenditures of human energy. Not by chance does K. Marx in one of his manuscripts place side by side manual labor, the power of steam, and the power of a horse. He writes: "...in one sphere of production, in agriculture, the power of steam, the power of a horse, and manual labor compete with each other, revealing their relative value in the sense of efficiency and economy...."(12) K. Marx directed particular attention to the superseding of the power of the horse by the power of steam and to the fact that the use of machines is profitable only where the power of animals (like the power of man) is superseded by a less expensive mechanical motive force, which operates for a longer time and more uniformly.(13)

With the mastering of each new type of energy, which is consumed in production, the conditions are created for a radical qualitative change, for a leap in the area of the development of productive forces. "It transforms the simple forces of nature--such as water, wind, steam, electricity, and so on--into potentialities of social labor."(14) And, finally, not by chance did the classics of Marxism-Leninism link major technical changes in production with the mass use of the energy of steam and then electricity, calling them: "the revolution of steam," "the revolution of electricity." Given such changes not only equipment, but also production technology changed: the revolution in productive forces acts as a technological revolution.(15)

The development of equipment and technology in different sectors occurs nonuniformly. Scientific and technical ideas cannot appear and be introduced simultaneously and uniformly in all fields of human knowledge, the uniform and simultaneous introduction of new technologies and equipment immediately in all sectors of production is all the more impracticable. This is explained if only by the fact that the product of some sectors is the technical base or technological means for the improvement of other sectors of production. Thus, under present conditions "the plans of the modernization of the national economy on the basis of the latest achievements of science and technology, in the end, are being held up by machine building."(16) Finally, it is necessary to bear in mind that every spiral of scientific and technical progress "is directly brought about by the excess of the need over the possibility of meeting it by the former means of production."(17)

Every given family of machines and every given type of technology, as a rule, is constantly improved in the process of their use in production and their consumption in production. All the activity of efficiency experts is aimed at precisely this. However, here both equipment and technology remain qualitatively unchanged, undergoing mainly gradual, quantitatively specific improvements. For example, the efficiency of machines gradually increases, the performance of equipment increases, labor productivity increases, the production cost decreases. It is possible to express all this in synthesized form as the decrease of the power-output ratio per unit of product being produced.

However, the process of such improvements is not unlimited: each family of machines or other equipment has a limit, which theoretically is an efficiency

equal to 100 percent. But in practice the limit of the improvement of equipment and technology without a radical qualitative change of technical and technological ideas comes much earlier. At the same time the needs of society constantly increase, this requires the further increase and improvement of production. And then there is no other solution but a radical qualitative leap in equipment and production technology and the changeover to a new generation of machines, which embody qualitatively new ideas.

The introduction of new equipment and technology in production every time begins in practice when the increase of the effective impact (of the product or service) exceeds the increase of the energy expenditures, that is, when /the power-output ratio of a unit of a product proves to be less than in case of the previous equipment or in case of the previous technology/. The practical efficiency in case of the introduction of this new equipment and technology, as a rule, is less than the theoretically calculated limit. This signifies the existence of new opportunities for the further progress of new equipment and technology on the basis of its constant improvement and rationalization.

Under present conditions the changeover to fundamentally new equipment and technology always occurs on the basis of the implementation of new scientific ideas, and that is why it should be regarded as a /scientific and technical revolution/. The improvement and modernization of the equipment and technology being used on the basis of gradual rationalization, which, as a rule, does not require new scientific ideas and does not lead to a radical qualitative change of equipment and production technology (although it does make it possible to achieve an increase of efficiency), should be regarded as the /evolution/ of equipment and production technology. Both these processes interact in a most whimsical manner and are interwoven, representing the basis for each other: a revolutionary leap in equipment and production technology affords new possibilities of evolutionary improvement, which in turn brings equipment and production technology to such a level, when further development can occur only in the form of the next qualitative leap.

Whereas in the past such radical qualitative changes in production occurred extremely rarely, while the evolution of equipment proceeded quite slowly, in the middle of this century these processes sped up sharply, although scientific and technical progress itself, as before, is taking place by both revolutionary and evolutionary means.

It should, however, be emphasized once again that this process in different sectors occurs extremely unevenly. While in the past 35 years in computer technology four or five generations have been replaced, in ferrous metallurgy only fundamentally new technical and technological solutions have appeared. The indicated nonuniformity is being noted not only in different sectors, but also in different countries.

Calculations are cited below. In them, true, the expenditures of human energy in production do not find reflection in direct form, but with each year the proportion of these expenditures in the total amount of energy expenditures is becoming less and less and "the energy of individual manpower is disappearing," K. Marx said, "as an infinitesimal value."(18) This gives us

grounds in characterizing the pace of the scientific and technical revolution and scientific and technical progress in terms of the indicator of the power-output ratio to divert our attention from the consideration of labor expenditures in their immediate form, especially as the increase of labor productivity is bought at times at an excessively high price, which leads to the decrease of production efficiency. For example, from 1973 to 1984 the consumption of energy resources in Japan increased from 407 million kiloliters to 436 million kiloliters of standard fuel, that is, by 7 percent. During the same years the national product of Japan more than doubled. Thus, the power-output ratio of the products being produced and the services being performed in 1984 came to 53 percent of the 1979 level; in other words, this indicator decreased annually by 5.6 percent.(19) In our country from 1970 to 1984 the gross national product increased (in actual prices) by 109.4 percent; the energy expenditures in the national economy increased during the same years by 65.6 percent.(20) Thus, the power-output ratio of the gross national product decreased during the indicated years by 21 percent, which comes on the average to 1.65 percent a year. This testifies that in our country during the indicated years technical progress occurred mainly by the evolutionary means. This conclusion was also confirmed by the dynamics of such indicators as the materials-output ratio, the metal content of the national product, and so forth. In this connection it is impossible not to recall: in the Policy Report of the CPSU Central Committee to the 27th party congress it was emphasized with all certainty that we "have not realized all the criticality and urgency of the changeover of the economy to intensive methods of development and the active use in the national economy of the achievements of scientific and technical progress."(21)

What first of all is it necessary to do, what theoretical and practical problems in the area of economics need to be solved, in order to ensure a sharp turn of the national economy toward the extensive use of the achievements of the scientific and technical revolution? In essence, precisely this question was posed with all urgency by Comrade M.S. Gorbachev in the report at the June (1986) CPSU Central Committee Plenum.(22)

A very important aspect of the solution of this problem is the instructions, which are contained in the Policy Report of the CPSU Central Committee to the 27th party congress, that "it is necessary to carry out more vigorously the turn of science toward the needs of the national economy. But the turn of production to face science and its maximum receptivity to scientific and technical achievements are just as important."(23)

In the "science-production" "tandem" science should be the leader. Every time that the possibilities of the evolutionary improvement of equipment and production technology are exhausted or owing to some other economic conditions and circumstances a radical qualitative leap in the development of the technical base of production is required, science should support it with a sum of new ideas, discoveries, and inventions. With the acceleration of scientific and technical progress such a role of science, of course, is increasing. Here it is important to bear in mind that from the standpoint of the innovation cycle, which includes science and production, science itself is heterogeneous. It is subdivided into /academic (basic)/ science, which encompasses the system of academic institutes of the country; /sectorial

(applied)/ science, which encompasses the scientific research, planning and design, and technological institutes and similar organizations, which belong to ministries; /plant/ (which carries out engineering and technological development) science, which includes plant research and design bureaus, laboratories, as well as institutes which are a part of scientific production associations. /VUZ/ science, which has to increase decisively its contribution to the accomplishment of the tasks of accelerating the socioeconomic development of the country, holds a special place. "It is necessary to expand substantially the scale of scientific research and development, which are being conducted by higher educational institutions, and to achieve a sharp increase of their national economic efficiency. For this it is necessary to increase the amount of basic research by twofold and design, technological, and pilot experimental work by approximately three- to fourfold."(24)

With some degree of arbitrariness it is possible to divide the end results of the work of the three named levels of science in the following manner. The product of the basic sciences is discoveries, that is, the formulation of some new scientific truth and the demonstrated establishment of previously unknown objectively existing laws, properties, and phenomena of the material world. In accordance with Soviet legislation whatever makes radical changes in the level of our knowledge is regarded as a discovery.

The product of the applied sciences is inventions, such a new, previously unknown technical or technological solution of a problem in any area of the national economy, which yields a specific positive impact in the progressive development of equipment and production technology. Every discovery is the theoretical basis of a large number of inventions.

Engineering developments, which make it possible to insert one or another invention in an operating system of machines and to attach it to the technologies being used, are the product of plant science. As to VUZ science, it can and should perform any of the functions named above, that is, it functions simultaneously at all the "levels" of scientific development. VUZ science, while now concentrating more than 35 percent of the scientists of the country and performing not more than 10 percent of the research, has enormous reserves of unused scientific potential.(25) The special section "The Integration of Education, Production, and Science," in which the tasks of improving the interaction of VUZ science with production are posed and its basic directions are revealed, is singled out in the draft of the CPSU Central Committee of "The Basic Directions of the Reform of Higher and Secondary Specialized Education in the Country." The extensive enlistment of VUZ scientists for making an extradepartmental examination of designs and technical solutions might become one such direction. For the dynamic development of the economy and the acceleration of the socioeconomic development of the country it is necessary that new works, as well as modernized enterprises would surpass the now achieved level, and would not copy it. It is categorically prohibited to use in designs technological processes and equipment, which do not conform to the latest achievements of science and technology. But VUZ scientists should be in the vanguard of the search for new solutions and, without belonging to some specific economic department, can more than anyone give an objective evaluation of a proposed

design. Moreover, this affords possibilities of improving designs owing to the suggestions of VUZ science itself, which at times for years cannot make their way into practice.

All the units of science are closely interconnected and interwoven types of activity, which are aimed at the generation of new ideas and the implementation of developments. The main task today is to mobilize the entire existing scientific potential, organizational efforts, and physical assets for the quickest technical and technological reequipment of all the sectors of the national economy.

Taking this circumstance into account, socialist society is allocating vast and ever increasing resources for the financing of scientific activity. Whereas during the 9th Five-Year Plan the spending on science from all sources came to 77 billion rubles, during the 11th Five-Year Plan it came to 130.6 billion rubles. Here not only the absolute amounts of allocations are increasing. With each year science is taking a larger and larger share of the newly created product. Thus, whereas during the 9th Five-Year Plan it received 4.7 percent of the national income, which was used for consumption and accumulation, during the 11th Five-Year Plan it received 5.4 percent. Unfortunately, the scientific product is not increasing as rapidly as the spending on science. For example, during the 9th Five-Year Plan 78 discoveries were recorded in the state register, that is, on the average 15.6 discoveries a year, during the 10th Five-Year Plan 69 were, that is, on the average 13.8 annually, and in 4 years of the 11th Five-Year Plan 59 were, which on the average comes to 14.8 discoveries a year.

The impression is being created that the most significant results appear as a constant. They do not directly depend proportionally either on the amounts of financing or on the number of scientists, whose number increased from 927,700 in 1970 to 1,490,100 in 1985, or by 60.6 percent. Such a conclusion applies not only to the basic sciences and concerns not only discoveries. The situation in the area of invention is approximately the same. In particular, during the 10th Five-Year Plan 386 author's certificates for inventions were issued, or on the average 77 a year. In 4 years of the 11th Five-Year Plan 311 author's certificates were issued, or 78 on the average per year.(26)

There are many reasons for such a situation. There are both organizational and mainly economic reasons, which were spoken about at the 27th CPSU Congress. Much is now being done for the improvement of the organization of scientific research and the improvement of the wage system of scientists. However, there is also another question, the settlement of which requires the elaboration of scientific criteria. This is the question of the conditions of the establishment of new scientific subdivisions in promising directions of scientific progress and scientific and technical progress and the elimination of such scientific subdivisions, which have exhausted the possibilities of the further development of research or owing to other circumstances for a long time have not yielded any real results. Flagrant examples of this sort were cited at the 27th CPSU Congress.(27)

One often has occasion to read about how an entire institute defends the honor of the uniform, does not accept inventions "from outside," but uses its

scientific potential only to discredit "another's" scientific development, "another's" invention, or else the inventor himself. And, of course, the basis here is economic, while not national interest, but group or personal interest--of a relatively small group of people or an individual worker, who derive, in reality, unearned income under the plausible cover of scientific activity and defend in every way the possibility of deriving such income in the future as well--plays the leading role. And although the practice of economic contractual scientific development does exist, the determination of the economic impact is still not possible in every unit of science. First, this is connected with the fact that it is far from always real, while the calculation itself is of an arbitrary nature. Second, on the path from a scientific idea to its introduction in production and to production innovation both the methods of development and the stimuli change, due to which the real expenditures of society differ from the anticipated expenditures. And, finally, third, excessive attention to the monetary valuation of one scientific product or another can have the result that the absence of a result, which can be calculated economically, will place a very important and promising scientific development in the category of economically unprofitable and, therefore, undesirable developments. Moreover, in socialist society often commercial goals, just as unfavorable monetary valuations, should not overshadow the necessity of such scientific developments, which provide an important social impact (the making of production processes healthier, the elimination of physically difficult or harmful labor, nature conservation, and so forth).

Unfortunately, today we do not have a theoretical basis or if only an economically sound mechanism of the evaluation of the activity of scientific subdivisions, which makes it possible to determine more or less precisely in which cases the development of one scientific direction or another has the right to economic support on the part of society, and in what cases it is economically advisable to shut down one direction or another of "research" up to the elimination of individual scientific subdivisions. Science is a living developing organism, and ideas of immortality are inapplicable to it, just as to any living organism. While some directions emerge and develop, others should die. Whereas under capitalism this process occurs spontaneously, under the conditions of the socialist economy the elaboration of specific criteria and the corresponding mechanism of the accomplishment of the tasks of developing and improving scientific activity itself is necessary. Otherwise the expenditures of resources on the maintenance of science will increase, while their effectiveness will decrease.

At the 27th CPSU Congress it was emphasized: "One of the most important directions of scientific and technical progress is the extensive assimilation of advanced technologies. Only by having taken such a route, will we be able to achieve such a change, which would lead to a qualitatively new state of not only individual types of production, but also entire sectors."(28) Today there are many such technologies: powder metallurgy, laser, plasma, and membrane technology, high-temperature catalysis, and so forth. For example, more than 30 different technologies were developed and introduced in the system of the Ukrainian SSR Academy of Sciences during the 11th Five-Year Plan for the protection of metals against corrosion. In particular, the experience of the Brovary Plant of Powder Metallurgy, which produces about

600 descriptions of parts for different sectors of industry, testifies to what new technologies can provide for the national economy. On each 1,000 tons of items the enterprise saves 2,000 tons of metal, 80 metal-removal machine tools, and the labor of 190 skilled workers. The plant has compensated the expenditures on its construction by fourfold.(29) Unfortunately, for the present there are still few examples of this sort. On the other hand, we now have many completed developments, which it is possible to introduce in industry and which are not being introduced. Indeed, during the years of the 11th Five-Year Plan 30 percent of the registered inventions,(30) moreover, far from always the most promising ones, were introduced and assimilated in production. What is more, according to the data of the USSR State Committee for Science and Technology, 80 percent of the developments, which are regarded as introduced, are being used at only one enterprise.(31) And although during the 11th Five-Year Plan the most diverse levers of the acceleration of scientific and technical progress (economic, organizational) were put into effect, very important decrees, such as the decree of the CPSU Central Committee and the USSR Council of Ministers of 18 August 1983, "On Measures on the Acceleration of Scientific and Technical Progress in the National Economy," were adopted, a large-scale economic experiment was conducted, and a unified fund for the development of science and technology (YeFRNT) was established in 28 ministries, serious changes were not achieved. Even after the 27th CPSU Congress not everyone has yet been filled with anxiety about the state of affairs in the area of scientific and technical progress. It is impossible not to direct attention to the fact that during the 1st quarter of 1986 the plan on the introduction of new equipment was fulfilled by only 87 percent, while the plan on the assignments of scientific and technical programs was fulfilled by 91 percent.(32) And there is no guarantee that the most effective measures did not remain in the "percent," which proved to be unfulfilled. From what has been said it is possible to draw only one conclusion: obviously, serious obstacles still exist in the way of the extensive dissemination of new technologies and new equipment and in the way of their mass assimilation in production and extensive introduction at enterprises and, as usual, economics plays a decisive role here.

Take, for example, such an important question as the extensive introduction of advanced electronics. Electronic devices, which should now be an integral part of the design of any machines and units, in machine building, and in other sectors, for the present are still being used inadequately. At present substantial positive changes have appeared here. In the report at the June (1986) CPSU Central Committee Plenum Comrade M.S. Gorbachev noted that in the sectors of instrument making and the electronics industry "real prerequisites have already been created to solve in a short time the problem of the assimilation of high-performance computers and to ensure the large-scale production of means of the electronization of machine building and other sectors of the national economy."(33)

Scientific and technical progress, as was shown above, occurs by both revolutionary and evolutionary means. However, given the established system of economic evaluations and indicators what is advantageous to society is not always advantageous to the enterprise. Without having fully utilized the economic impact, which it is possible to derive by the evolutionary improvement of the equipment and technology being used in production,

enterprises most often are not interested in the radical qualitative reorganization of production. The introduction of new and the latest equipment and technology, that is, the revolutionary transformation of production, nearly always costs more, but at first yields a smaller economic impact than the evolutionary development of equipment and technology. But even when from the first steps the revolutionary transformation of production yields an appreciable economic impact, new equipment and technology in the system of prevailing evaluation indicators are unprofitable for enterprises.

Obviously, such a system of planning and evaluation indicators and economic relations between the enterprise and the budget, as well as between different enterprises, which would make advantageous for each enterprise precisely what at each given moment from the standpoint of the scientific and technical revolution is advantageous for society, is needed. The decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1985, "On the Extensive Dissemination of New Methods of Management and the Increase of Their Influence on the Acceleration of Scientific and Technical Progress," is a significant step in this direction. This decree provides for the use of systems of prices for products for industrial purposes and the establishment of discounts and markups on the list wholesale prices subject to the quality and competitive ability of the items being produced. Through the system of economic sanctions and stimuli this decree brings the interests of production collectives and individual workers closer to the interests of the state. And nevertheless the indicated measures are only the first step in the system of the economic actions, which should be taken for the purpose of accelerating scientific and technical progress. It is necessary to develop and substantiate theoretically /the more extensive use for these purposes of commodity-money relations/, for the improvement of financial and credit levers and the conditions of the use of the Unified Fund for the Development of Science and Technology at industrial enterprises and the accomplishment of full cost accounting and the further development of the system of material stimuli depend on this. The goal of the proposed discussion of the economic problems of the acceleration of scientific and technical progress in our country also consists in this.

The 27th CPSU Congress specified the general directions of the acceleration of scientific and technical progress as the main lever of the acceleration of the economic and social development of the country. The congress also outlined the main directions of the reorganization of the economic mechanism, which should overcome the expenditure nature of the economy and aim all enterprises at the increase of quality and efficiency, the acceleration of scientific and technical progress, and the increase of the role of the human factor. Of course, such work is far from simple. It requires "considerable efforts, time, and the greatest responsibility. And, having begun the transformations, one must not confine oneself to half-hearted measures. It is necessary to act consistently and vigorously, without stopping at the boldest steps."(34) Soviet economists can and should make their contribution to this work.

FOOTNOTES

1. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza" [Materials of the 27th Congreess of the Communist Party of the Soviet Union], Moscow, 1986, p 102.

2. "Materialy Plenuma Tsentralnogo Komiteta KPSS 16 iyunya 1986 goda" [Materials of the CPSU Central Committee Plenum on 16 June 1986], Moscow, 1986, p 11 (the italics are mine--L.L.).

3. See John Bernal, "World Without War," Moscow, 1960, p 217.

4. See "Sovremennaya nauchno-tekhnicheskaya revolyutsiya. Istoricheskoye issledovaniye" [The Modern Scientific and Technical Revolution. A Historical Study], Moscow, 1970, pp 3, 7, 9, 13, 21, 42.

5. See "Nauchno-tekhnicheskaya revolyutsiya i izmeneniye struktury nauchnykh kadrov SSSR" [The Scientific and Technical Revolution and the Change of the Structure of USSR Scientific Personnel], Moscow, 1973, p 9.

6. See V.A. Zhamin and I.M. Vladimirova, "Nauchno-tekhnicheskaya revolyutsiya i preimushchestva sotsialisticheskoy sistemy khozyaystva" [The Scientific and Technical Revolution and the Advantages of the Socialist Economic System], Moscow, 1972, p 6.

7. N.P. Ivanov, "NTR i problemy struktury rabochey sily" [The Scientific and Technical Revolution and Problems of the Structure of Manpower], Moscow, 1978, p 10.

8. "Ekonomicheskaya entsiklopediya. Politicheskaya ekonomiya" [An Economic Encyclopedia. Political Economy], Vol 3, Moscow, 1979, p 40.

9. See K. Marx and F. Engels, "Soch." [Works], 2d edition, Vol 20, p 18.

10. K. Marx, "Manuscript Legacy," KOMMUNIST, No 7, 1958, p 22.

11. T. Khachaturov, "Once Again on the Effectiveness of Capital Investments," VOPROSY EKONOMIKI, No 3, 1983, p 65.

12. K. Marx and F. Engels, "Soch.," 2d edition, Vol 47, p 462.

13. Ibid., p 461.

14. Ibid., p 355.

15. Ibid., p 461.

16. "Materialy Plenuma Tsentralnogo Komiteta KPSS 16 iyunya 1986 goda," p 24.

17. K. Marx and F. Engels, "Soch.," 2d edition, Vol 47, p 461.

18. K. Marx and F. Engels, "Soch.," 2d edition, Vol 46, Part II, p 205.

19. See PRAVDA, 14 January 1986, p 4.

20. Calculated according to "Narodnoye khozyaystvo SSSR v 1984 g." [The USSR National Economy in 1984], Moscow, 1985, pp 55, 59, 424, 425.

21. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 23.

22. See "Materialy Plenuma Tsentralnogo Komiteta KPSS 16 iyunya 1986 goda," p 18.

23. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 28.

24. "The Draft of the CPSU Central Committee of 'The Basic Directions of the Reform of Higher and Secondary Specialized Education in the Country'," PRAVDA, 1 June 1986, p 3.

25. See "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 28.

26. See "Narodnoye khozyaystvo SSSR v 1984 g.," p 108.

27. See PRAVDA, 1 March 1986, p 3.

28. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 237.

29. See PRAVDA, 4 February 1986, p 2.

30. Calculated according to "Narodnoye khozyaystvo SSSR v 1984 g.," p 108.

31. See PRAVDA, 4 February 1986, p 2.

32. See IZVESTIYA, 1 June 1986, p 2.

33. "Materialy Plenuma Tsentralnogo Komiteta KPSS 16 iyunya 1986 goda," p 22.

34. "Materialy XXVII syezda Kommunisticheskoy partii Sovetskogo Soyuza," p 23.

7807
CSO: 1814/118

FINANCING OF SCIENCE, TECHNOLOGY IN EUROPEAN CEMA COUNTRIES

Moscow EKONOMICHESKAYA GAZETA in Russian No 52, Dec 86 p 18

[Article by Candidate of Economic Sciences A. Khachaturyan: "Cost Accounting in the Sphere of Science and Technology"; first paragraph is EKONOMICHESKAYA GAZETA introduction]

[Text] The expression "the introduction of new equipment" became customary long ago. We have been pondering, however, why one has to namely "introduce," in other words, "push" new equipment into production, often encountering the resistance of its immediate users? Why do enterprises for the present treat innovations very coolly?

The answer to these key questions for the acceleration of scientific and technical progress lies in the idea, which for a long time was the basis for the stimulation of the assimilation of new equipment and reduced to the narrow purposeful encouragement of enterprises for the use in production of the latest scientific and technical achievements. An idea which essentially contradicts logic: to pay an enterprise for the use, let us suppose, of equipment which will operate better than obsolete equipment.

The only means of resolving this paradox consists in the improvement of the economic mechanism and the formation of a demand for new equipment and an active interest in its use. This requires a new view of the management of scientific and technical progress. Briefly its essence consists in the development of cost accounting in the sphere of science and technology and the strengthening of the economic interrelationship among all the participants in the "science-technology-production" cycle.

The Sources of Financing

Today it is obvious that the main thing in the acceleration of technical progress at the present stage is the strengthening of internal economic stimuli and the consideration of the interests of enterprises themselves. Thus, one of the reasons that financial resources are spent on scientific and technical progress with a small return is the fact that they, in reality, are not earned by the collective of the enterprise, but are allocated to it by the state.

In the majority of European CEMA countries in the formation of systems of the financing of scientific and technical progress they have begun to take the path of the more complete coordination of national economic interests and the interests of the individual participants in the "science-technology-production" cycle. The system of funds for the development of science and technology, which are being established at all levels of management--the national economic and sectorial levels and in the basic production unit--is aimed at this. The basic functional purpose of the centralized funds is the shifting of the increased financial risk, which is connected with the development and introduction of fundamentally new equipment, from the sphere of the cost accounting interests of the enterprise (with its limited resources and means) to the national economy as a whole. At the same time financial resources are being transferred to associations, combines, and large enterprises for the settlement on a cost accounting basis of the questions of the increase of the technical level of production, the output of new items, and the improvement of product quality.

The bulk of the assets of the technical development funds are concentrated within large production economic units, which conforms to the increase of their role in the assurance of the scientific and technical development of production. In contrast to the production development funds, which are primarily of an investment nature, the assets of the technical development funds are used for the financing of research and development, the purchase of licenses and "know-how," and the reimbursement of a portion of the outlays on the assimilation of the production of new equipment.

As a rule, the formation of the assets of these funds is accomplished by means of the corresponding additions to the product cost. In the GDR, for example, the size of the science and technology funds (FNT) of combines is made dependent on the economically sound financial outlays, which are necessary for the fulfillment of the assignments of the plan on science and technology. This fund is created at the level of the combine as a whole, but the general director decides at which enterprises of the combine their own similar funds will be formed. Besides the additions to the product cost, which make up 90 percent of the assets of the fund, assets from the sale of the results of their own research and development within the country and abroad are additionally channeled into the science and technology funds.

The assignments, which are established in the corresponding "notebooks of obligations" of the performers, are the basis of the special-purpose allocation of assets from the science and technology funds. The general directors of combines give permission for the use of the assets of the science and technology funds only if the goals and deadlines of the performance of research and development, which are established in the "notebooks of obligations," satisfy the requirements of the increase of production efficiency. Here the decision on the continuation and the amounts of subsequent financing is made with allowance made for the results of the fulfillment of the control stages of the plan assignment. But in Hungary, for example, the technical development funds are formed in conformity with standards of deductions from the profit, which are differentiated by sectors and subsectors. A certain flexibility has been given to these funds--enterprises can exceed their amount, which is prescribed by the norms, at the

expense of the profit in that instance when the overexpenditure of the assets of the technical development fund will yield a significant economic impact.

The Goal Program Method

In recent years in many European CEMA countries the goal program approach has begun to be used actively in the financing of scientific and technical progress, first of all when implementing scientific and technical programs and other comprehensive measures.

The goal program method has become widespread, for example, in Bulgaria, Hungary, the GDR, and a number of other CEMA countries. Thus, in Bulgaria the main organizations for programs distribute the financial resources, which have been allocated for their fulfillment, conclude contracts with the coperforming organizations for the accomplishment of program tasks or stages of work, and stimulate materially individual collectives and performers.

In Hungary for each of the programs a special fund, which serves as a centralized source of financing of the measures envisaged in them, is formed.

In the GDR research and development in accordance with programs are financed from two sources--the state budget and the funds for science and technology of combines. The allocation of assets from the funds for science and technology is carried out only by special assignment in accordance with the decision of the general director of the combine. The minister for science and technology in consultation with the minister for finance and the chairman of the State Planning Commission makes the decision on the distribution of the budget assets which have been allocated for the corresponding year being planned. The system of the supervision of the implementation of the program is based on personal responsibility for the fulfillment of its assignments on the part of the executives of ministries and departments, the president of the Academy of Sciences, and the general directors of combines. In this they are all accountable to the Ministry for Science and Technology.

One of the modifications of the program financing of scientific and technical progress at the level of specific scientific and technical organizations is the "theme-money" method of financing. At present this method is being used more and more often in sectorial science, superseding the previously widely used financing of the activity of the organization as a whole. The former of these methods consists in the fact that the planned amount of financial assets is calculated on the basis of the estimates that have been planned for the elaboration of the theme. The latter consists in the fact that a kind of limit of monetary assets, in accordance with which it plans its scientific and technical activity, is allotted the organization.

The experience of the fraternal countries shows that thematic financing is most advisable in the area of applied research and development. As a rule, cost accounting sectorial scientific and technical organizations, which efficiently compare the expenditures and results for each theme, take into account the impact from introduced developments, and use the "comprehensive" planning and financing of operations on each theme, conduct them. One of the basic conditions of the changeover of these organizations to financing

according to the "theme-money" method is the introduction at them of internal cost accounting for special-purpose thematic subdivisions and the more extensive use of the program organization of operations.

Contractual Practice

The practice of concluding economic contracts on the performance of research and development in recent years has undergone considerable dissemination in a number of fraternal countries. As a rule, the deadlines, conditions, and procedure of the transfer by the developer of the new item, the contractual price, the conditions and amounts of incentive markups, the method of payment, and the conditions of cooperation in the introduction of the results of research and development are stipulated in similar contracts. In addition, in several CEMA member countries contracts for the transfer of the results of research and development to third organizations, which did not take part in the financing of development, are being used in practice.

Not only compensation for their expenditures, but also the corresponding economic incentive for activity in the search for potential users of their developments are provided to the scientific and technical organizations which turn over the results of their developments for introduction.

In the GDR the drawing up of a "notebook of obligations" has been a mandatory stage of the preparation of contracts for research and development since 1982. The lower limits of the efficiency of items are established here. Thus, at the Ernst Tellman Heavy Machine Building Combine in Magdeburg the lower limits of efficiency are given within the following range: the increase of the consumer properties of new items--30-60 percent, the ratio of the expenditures on research and development and the impact from the use of their results should come to not less than 1:5, the specific expenditures on technological processing should be reduced by more than 20 percent, while the degree of completeness of the processing of materials should be increased by 20-25 percent. Representatives of consumers, suppliers, organs of domestic and foreign trade, as well as the department for standardization, metrology, and quality control take part in the discussion and defense of the scientific, technical, and production goals, which have been set in the "notebook of obligations," and in the evaluation of the results, which have been obtained at the intermediate and final stages.

The practical experience of a number of fraternal countries in the use of contracts in case of the transfer to third organizations of already obtained results of research and development is also of interest. In Bulgaria, for example, special contracts, which provide for a fee for the use of developments, are concluded. It is a part of the revenue which has been derived by third organizations. If the developer acts as the initiator of "duplication," it receives 75 percent of the corresponding amount, while the remaining 25 percent enters the revenue of the organization that financed the development. Thereby the developers are actively stimulated in the
ts, since this increases their revenue and,
tes a basis for giving material incentives to their staff members.

In Hungary the payment for the transfer of a development to third organizations can be made on a contractual basis in two forms: as a lump sum or by deductions of a portion of the revenue of the organization, which borrowed the development, over a set time. If the financing of a development was carried out by means of centralized assets of the Hungarian National Technological Development Commission (GKTR), the enterprises introducing it will have to compensate for the assets, which were invested by the National Technological Development Commission, by means of their own technical development funds.

7807
CSO: 1814/123A

ENERGOKHIMMASH SPECIAL DESIGN BUREAU

Moscow PRAVDA in Russian 26 Jan 87 p 3

[Article by PRAVDA correspondent Ye. Solomenko (Novosibirsk): "The Homeless Plasma Generator. Why Is the Establishment of a Center of New Technologies Being Held Up?"; first three paragraphs are PRAVDA introduction]

[Text] I enter the rather empty building, which still preserves traces of recent construction.

"This is the unit for plasma spraying," Professor Anatoliy Petrovich Burdukov, director of the special design bureau, indicates. "Over there we are installing a unit for the high-frequency strengthening of materials. And there, nearby, we will strengthen them by means of electron-beam, detonation, and laser units."

The very listing of so diverse equipment could not but be intriguing....

But let us begin in order. The Energokhimmash Special Design Bureau emerged among the sectorial scientific research institutes and design bureaus of what is called "the belt of introduction," which in the 1960's and 1970's was established around the Novosibirsk academy campus. The Energokhimmash Special Design Bureau quite rapidly established the closest creative contacts with a record number of institutes of the Siberian Department of the USSR Academy of Sciences.

Despite departmental subordination (the bureau operates under the aegis of the Ministry of Chemical and Petroleum Machine Building), the bureau constantly broadened the sphere of its activity. The equipment and technologies, which were originated within the walls of the Energokhimmash Special Design Bureau, entered the shops of many machine building sectors, the Ministry of the Petroleum Industry and the Ministry of Power and Electrification, the agroindustry, the ministries of fertilizers, the electronics and radio industries, ferrous and nonferrous metallurgy....

In this case a large national economic impact is being achieved. Take if only the following example. Several years ago the enterprises of the Ministry of the Chemical Industry almost drowned in their own (moreover, toxic) organochlorine waste products, which had to be burned. But in so doing

hydrochloric acid was formed and was carried into the atmosphere, then it fell with the rain to earth. And then sectorial science proposed a solution: the plasma conversion of toxic residues into a useful product--a solvent of varnishes and paints. But a powerful plasma unit was necessary for this.

The conventional plasma generator of those years could operate continuously a maximum of 15 hours. They had to develop a unit which operates hundreds of hours in a row. An arc with a temperature 1.5-fold higher than on the surface of the sun should have burned hundreds of hours in the flue of the plasma generator!

This work of specialists of the Energokhimmash Special Design Bureau and scientists of the Institute of Thermal Physics continued for 5 years. And now the plasma chemical unit, which was developed by the people of Novosibirsk and converts waste products into tons of useful product, is being prepared for interdepartmental tests.

Given the great diversity of the operations being performed here it is possible to reduce them to two main directions: the development of equipment for plasma and strengthening (electron-beam, laser, and other) technologies. But precisely these directions determine the nature and pace of today's scientific and technical progress.

In Novosibirsk the leading scientific school of plasma technologies in the country was established and grew strong at the Institute of Thermal Physics under the supervision of Corresponding Member of the USSR Academy of Sciences M. Zhukov. While the special design bureau is connected precisely with this institute by the strongest creative bonds. In essence the bureau also detached itself from it: when the decision on the establishment of the special design bureau was made, a large group of researchers decided to transfer from institute laboratories to the new design bureau, so that the most important academic developments would not lie as a useless load on dusty shelves, but would find a wide path into the shops of works of today and tomorrow.

Now plasma technologies are making it possible to obtain rare metals and valuable chemical raw materials, mineral and phosphorus fertilizers, to produce steels of special brands and other special alloys, to carry out the deep refining of petroleum and gas condensate, and to produce surgical instruments and much more. And all this is a considerable service of the collective of the Energokhimmash Special Design Bureau.

But, despite the present successes, the question of the development of powerful and reliable industrial plasma generators and new technological units for the application of coatings and strengthening is urgent. Laboratory models of them are already alive and operating. Now it is necessary to bring them up to production requirements and to organize mass introduction. By entering shops everywhere, they will ensure a new qualitative level of the equipment being produced in the country. This is equivalent to a gain of hundreds of new machine building enterprises, this is the elimination of thousands of repair plants.

For this reason the Ministry of Chemical and Petroleum Machine Building and the Siberian Department of the USSR Academy of Sciences decided to establish on the basis of the Siberian special design bureau by the end of 1987 the first intersectorial center of plasma and strengthening technologies in the country.

And now we are walking through the new building, where this center will be located and where the first units are already being installed. A large number of units, which are emerging here, in their main parameters surpass foreign models. And during the current five-year plan the collectives of the bureau and the Institute of Thermal Physics have to consolidate their priority, having developed new "world record holders"--powerful technological plasma generators.

But if the collective of the bureau succeeded in achieving such significant gains, it did so only owing to its own dedication. For from the very moment of its birth and to this day the bureau has lacked its most important, most necessary component--a pilot works.

And although in this regard the corresponding orders were repeatedly issued by the Ministry of Chemical and Petroleum Machine Building, they simply remained a paper monument to formalism and inefficiency.

Only now, when the question of establishing a center of advanced technologies has been put point-blank, has the special design bureau been "enriched" by new premises. Incidentally, the special design bureau also built it with its own resources, with its more than modest forces. It built it over nearly 4 long years. And by "parasitic" methods besides: the facility being built has been officially registered as...a warehouse. And only just recently, already after the change of management, did its own ministry agreed to officially recognize this illegitimate child.

Incidentally, the placement of the first building into operation did not solve the problem. The fate of the future engineering center depends on whether it will be possible to complete another "warehouse facility," which has arisen not far away.

In front of me are two documents. The first is the decision which the 27th party congress inserted in the Basic Directions: "To ensure the extensive introduction in the national economy of fundamentally new technologies--electron-beam, plasma, pulse...." And the second is the report on the progress of the construction of the center. In it there is listed in detail what is required for its quickest completion and what assistance is needed on the part of the Main Administration of Housing and Civil Construction of the Novosibirsk City Soviet Executive Committee, the Administration of Material and Technical Supply of Western Siberia, the Oblast Planning Commission, and other local "departments".... Checks have been made in pencil next to the majority of paragraphs: rejected. For the center, at which units, which are super-advanced and the best in the world, will be developed, 50 "cubes" of cement were not found! As both crushed stone and white pigment "were not found." All this is so up to now and would be "an insoluble problem," if it were not for the active assistance of local party organs.

And this is in Novosibirsk, which has a most powerful industrial and construction sector. The Sibakademstroy Administration, the Main Administration of Construction of the Novosibirsk City Soviet Executive Committee, and many other "construction administrations" of all kinds are located here!

All these years its own, "real" sector refused the collective of the special design bureau really earnest support. True, the new Minister of Chemical and Petroleum Machine Building V. Lukyanenko, who was recently appointed to this post, is speaking in favor of all kinds of intensification of the work, which is connected with the development and extensive introduction of new strengthening technologies, and in favor of the further development of creative relations of the sector with the Siberian Department of the USSR Academy of Sciences. I want to hope that the new management of the ministry will turn to face the needs of its own design bureau. The decision made in December 1986 to transform the bureau into an affiliate of the Scientific Research Institute of Chemical Machine Building--the main institute of the ministry--was recognition of the unquestionable services of the special design bureau.

The 20th century is a generous trickster, it is bombarding us with miracles, and we are already getting tired of being amazed at them. But I could not but be astonished in observing with what magical possibilities the scientists and designers had endowed these tens of suns, which are hidden in the electric arc of the latest plasma generators. I looked at the parade of miracle units and regretted that another plasma generator, which could master the most refractory, strongest alloy--inertness, stagnation, and indifference--so far has not been developed. Incidentally, here no longer scientists should act as the "developers."

7807
CSO: 1814/123A

START INTERBRANCH TEMPORARY SCIENTIFIC TECHNICAL COLLECTIVE

Moscow EKONOMICHESKAYA GAZETA in Russian No 12, Mar 87 pp 14-15

[Article by Special Correspondent N. Yanovchuk under the rubric "The Yield of the Scientific Potential" (Novosibirsk-Moscow): "A Running Start: The First Temporary Scientific Collective in the Country Has Covered Two-Thirds of Its Route"; capitalized passages published in boldface]

[Text] Flexible Structures Are an Imperative of the Times

In many cases the traditional structures of scientific institutions predetermine the long marking of time by collectives. It is no big secret that some scientific associates and subdivisions of institutes include in the plans for the year and for the five-year period the same theme, which they have elaborated and which is no longer urgent. The time of the conducting of development is specified very arbitrarily. Frequently the required result is also designated in the plans by the most indefinite outlines.

In recent years the search for new organizational forms of performing work, which make it possible to concentrate forces and resources on the most important directions, has been stepped up sharply. Such promising forms as interbranch scientific technical complexes, engineering centers, and temporary scientific collectives for solving major intersectorial problems have emerged.

The statute on the temporary collective envisages very strict conditions. The scientific and technical task is posed precisely. No more than 3 years of time are given. No extension of the deadline is permitted. Asserts from the reserve of the State Committee for Science and Technology are allocated simultaneously for the entire development. A specific amount for the wage of staff members and a significant amount for incentives, which, moreover, is deposited, as if in a savings bank, until completion and delivery of the work, are envisaged in them. It will be paid only in case of a successful result.

The average wage and the position at the former place is retained for the workers who are transferred to the temporary collective.

Today 10 such interbranch temporary scientific technical collectives are operating in the country. The very first of them--Start--was created about 2 years ago on the basis of the Computer Center of the Siberian Department of

the USSR Academy of Sciences for the development and experimental checking of the basic elements of concept of new-generation computers. In addition to scientists of Novosibirsk, researchers of the Cybernetics Institute of the Estonian SSR Academy of Sciences and the Computer Center of the USSR Academy of Sciences from Moscow and specialists of the Severodonetsk Impuls Scientific Production Association of the Ministry of Instrument Making, Automation Equipment, and Control Systems--155 people in all--became members of it. Within exactly 1 year they will have to present to an interdepartmental commission a prototype of a modular asynchronous expandable system (MARS) with software and hardware means of intellectualization and the corresponding systems and applied programs.

There Is One Solution: "Cut Corners"

Doctor of Physical Mathematical Sciences Vadim Yevgenevich Kotov, the director of Start, arrived at the banks of the Ob River in a group of graduates from the Moscow Engineering Physics Institute at the time when our Large-Scale Science had barely begun to take root in Siberia. They were awaited with great anticipation here. During a February snowstorm they were met on the railroad platform with flowers and felt boots. They were driven to the academy campus in a ZIM limousine. Then, to be sure, they had to sleep on desks for a long time, since there was nowhere to live. However, he had had a taste for real work all his life. For several years he worked at the International Federation for Information Processing and has zealously kept up with what was being done in the world in the area of the development of advanced computer hardware. He returned to Novosibirsk firmly convinced that against the background of the precipitous pace of the work being done in this field throughout the world our science is intolerably slow.

Not just Kotov realized that we were lagging. At the USSR Academy of Sciences the set up a commission to formulate proposals on the development of fifth-generation computers. Kotov was appointed cochairman. He presented proposals in the scientific area. They were accepted. But how are they to be implemented organizationally? There was no decision. They began to prepare a comprehensive program in this regard. After two sessions Kotov stopped attending them: he understood that about 5 years, not less, would be spent just on getting agreement on this program by ordinary means. Unfortunately, that is what happened. Documents 200 pages long, which were incoherent, and contradictory, did not bind anyone in any way..., appeared.

Meanwhile, in various parts of the country separate groups of scientists were solving individual local problems. They understood: it was necessary to gather together in one fist everything already produced and, by concentrating the best forces, to establish a breakthrough group, which is capable of "cutting corners" and making up for lost time both in the development of the design of the computer and program packages and in industrial technology, which had also turned out to be unprepared to implement advanced ideas.

The strategy proposed by them had unquestionable advantages. Kotov was invited to head the first temporary collective in the country. There were many people who aspired to become members of it. All were people who ardently wanted to work in the new way, toward a specific goal and had tired of their

own leisureliness. They made the selection captiously, accepting only those groups of scientists, who had a convincing scientific reserve and had demonstrated the ability to solve nontrivial problems in an advanced way.

However, the statute on the temporary collective does allow individual hiring. In Start they do not use this form. Here they are convinced that a tree which has been torn up by the roots from its native soil will not bear fruit for long. The very groups that have been accepted into the temporary collective are already making the personal choice of specialists. For example, from 1 laboratory of the Computer Center of the Siberian Department, which is made up of 12 people, only 9 were brought into the collective.

"People, after all, are divided into only two groups," Academician A.S. Alekseyev, the general director of the Informatika Scientific Technical Complex and director of the Computer Center of the Siberian Department of the USSR Academy of Sciences, is convinced, "into those who want to work and those who do not want to work. Under ordinary conditions we do not always notice this. But selection to the temporary collective separates these two categories better than any filter. Whoever does not like to work and does not have talent and skill will not get into a temporary scientific collective. And if we had to create temporary scientific collectives for other problems, this would naturally separate productive scientific personnel from the ballast.

The Pace, the Pace, and Again the Pace...

"Thus, a year remains to accomplish the task set for you. Do you intend to finish in that time?" I asked Ye.P. Kuznetsov, deputy director of Start.

"There are 260 workdays left," Yevgeniy Pavlovich states more precisely. "Do not be surprised: it is a matter not of years and months, but of days. A loss of even 1 week cannot be made up. The rhythm of life at Start differs drastically from the rhythm of activity of the academic institutes on whose base it functions. The style of the collective has taken in the best features of the industrial style of work with its unconditional discipline, intensity of plans, and orientation toward the end result."

The personification of this style is Kotov's two deputies. They are utterly different and complement each other excellently. Aleksandr Guryevich Marchuk, an extraordinary mathematician who equally knows like "iron" both the laws of the architecture of computer hardware and programming. He can converse in silence with the display screen the whole day through. The idea of V.Ye. Kotov, A.G. Marchuk, and Corresponding Member of the Estonian SSR Academy of Sciences E.Kh. Tyugu is that one must not squeeze one's own algorithms into a computer developed by someone, but, on the contrary, develop the architecture of a computer system, which is equal to the requirements of the problems of simulating complex objects, which are being solved on computer. A computer-aided design system, by means of which a modern level of the industrial production no longer of a prototype, but the future MARS system itself will be ensured, is now being developed by the temporary collective on the basis of this principle.

The second deputy director of the temporary collective is Yevgeniy Pavlovich Kuznetsov, a most modern manager. He is all the energy of action. Upon making someone's acquaintance, out of old Komsomol habit he introduces himself intimately: "Zhenya Kuznetsov." And he gives his two work telephone numbers--in Novosibirsk and in Moscow. The authorized representative of the four highly authoritative scientific collectives which have been united in Start, he spent a large part of his time in the capital during the first year and a half. I had occasion to meet him at that time. Smart, punctual, and goal-oriented, like an arrow flying to the required mark, he passed through the granite walls of the State Committee for Science and Technology, the Ministry of Finance, and the State Committee for Labor and Social Problems and eliminated and eliminated the very "insoluble problems" against which many good initiatives had been smashed to pieces.

It was very difficult to adjust the vital activity of the collective, which was formed from four parts. But the main difficulties are behind. Within Start structural subdivisions--divisions and laboratories--have been eliminated. Thirteen brigades have been organized. Even "interurban" brigades have been set up here to perform short-term jobs in various cities and at plants.

Both Stimuli and Accountability

The precise organization and fast pace are maintained by a well thought out set of incentives. In Start, for example, they have very intelligently exercised the right to establish salaries and the increments to them in accordance with the quality and results of the labor of each person. As a result, for the "heavyweight categories": brigade leaders and scientific associates--doctors and candidates of sciences--the wage has hardly changed. But among creative younger people (and they comprise the bulk of the collective) and engineering personnel it has been increased by approximately twofold as compared with the usual amount. And this made it possible to diminish the gap, which at times is in no way justified, between the remuneration of the labor of people who hold scientific and engineering or design positions at scientific institutions.

And the accountability is also not the same as in other divisions of the institute. Turning the work over every quarter to the commission, each brigade receives the corresponding evaluation according to a five-point system. Loss of a point means a 20-percent reduction of the estimated amount of the bonus for this period. But, as has been stated already, the bonus awaits the developers only in the future, after the entire job has been completed. This year they decided to take steps of more "rapid reaction"--any deviations and miscalculations, just as, incidentally, fruitful increased activity, immediately after the turning over of the quarterly stage of work affect the amount of the salary increment of the staff member.

At times the managers of Start have to be strict. There are two criteria of success of collective work: time and quality. A scientific associate, who went to a sanatorium on a hot travel pass and, therefore, did not turn the work in on time, was fined 300 rubles: he was deprived of the 100-ruble bonus for the entire quarter. A capable scientist from the Impuls Scientific

Production Association, a fine organizer who was able to quickly create an industrious and disciplined collective, had to be told "sorry, goodbye," because he himself wanted to work only on what seemed to him personally more necessary. Under ordinary conditions this was tolerable, in the temporary collective it is not.

Initial Results

The results of 2 years have confirmed the correctness of the adopted course and the indisputable advantages of the new form of organizing research. In the temporary collective it was possible to unite together people from institutes of various departments, who are capable of solving a major problem together within a given period. Here through the temporary collective the ministries easily make contact with each other, overcoming departmental barriers.

As a result in a relatively short time Start completed with small forces the designing and production of the MARS-M high-performance computer for scientific calculations with a speed on the order of 20 million operations a second. per second. The Kronos family of 32-bit processors, on the basis of which high-performance work stations, which made it possible to attain the present level of performance of superminicomputers, was developed.

Just half a year ago Kronos produced a sensation in the world of specialists. But, in the opinion of the authors, today it is already becoming obsolete, and they have already prepared the Kronos-2--the core of a system which does not have analogs.

With the appearance of operating Kronoses the attitude toward the orders and requests of Start on the part of the ministries concerned with electronics and computer technology changed simultaneously. One of them sent its own specialists to Start for the transfer of Kronoses to chips.

Large enterprises of the country are putting the module into production. At the Kama Motor Vehicle Works they are assimilating it for the automation of production. Aircraft builders have taken the module for installation on civilian airliners. Proposals on cooperation on a commercial basis have been received from recognized foreign firms that produce electronic equipment.

How tempting it is to roll up one's sleeves and to engage in introduction in order to see immediately one's creation embodied in a living machine! But the scientists of Start do not have the right to deviate from course: they have so few days to complete the complex scientific task--the development of MARS.

Given such a rapid pace of work the matter should be organized so that, as V.Ye. Kotov expresses himself, "the obstacle would be only in the head." Meanwhile there are still many external obstacles in the way of the collective.

Administrative and Management Personnel, Supply, and Other Problems

From the very beginning it was decided that temporary collectives do not create their own management personnel. The functional divisions of those institutes, on the basis of which they were formed, will serve them. And this is correct in principle.

In practice everything turned out to be much more complicated. For example, the supply division of the computer center of the Siberian Department of the USSR Academy of Sciences, which has about 1,000 persons, coped with the supply of the entire institute by conventional methods: they send a 2-year requisition to the State Committee for Material and Technical Supply, while further everything went as usual--unhurriedly and...unreliably.

It is understandable that the temporary collective, which was established on the basis of the Computer Center, could not wait either 2 years or even 2 months. It needed to supply itself immediately and as completely as possible.

Only 50 specialists of the Computer Center transferred to the temporary collective. But in this case the volume and complexity of the work of the institute's planning, personnel, and bookkeeping services increased several fold. While the engineering and supply subdivisions of the academic institute proved to be not at all capable of solving the problems linked with supporting the work of the temporary collective.

"A year ago, when I came once again to Moscow on matters of 'acquiring' the equipment we vitally needed and components," V.Ye. Kotov recalls, "it seemed to me that the collective was in complete crisis. When a brigade leader comes to me, he expects me to give him everything. And he gets mad: 'You have a lot of money, but you do not solve anything!' Yes, there is enough money. I am a 'millionaire' and, at the same time, a beggar with an outstretched hand. Wherever I go, they say to me everywhere 'there is none' or 'it is impossible'."

In the final analysis everything is settled, but at what incommensurate expenditures of time and human efforts! For example, terminals. At an institute, when they receive a new terminal, they divide it among divisions "in hand-to-hand fighting in the director's office. The managers of Start firmly insisted that in the temporary collective the personnel should to be freed from worrying about how to get the necessary computer time and where to find this or get that. Now every worker of Start has a terminal on his desk. And no matter how Academician A.S. Alekseyev's director's heart aches for the entire institute, he is well aware that the "breakthrough group" should be supplied in the best manner. Apparently, the procedure of allocating equipment and materials for temporary collectives should be different than for other scientific institutions--either from the reserves of the State Committee for Material and Technical Supply or on the basis of strategic requests.

How in Start did they get themselves out of the situation with a sharply increased amount of work on service? I will reveal the secret. They transferred a portion of their wage fund to the base organization for the

establishment of raises for the workers of the functional divisions, on which the extra burden fell. But this did not solve the problem. They had to keep their own, albeit minute staff under other job descriptions. Thus, one person performs the functions of the planning division, the accounting office, and the personnel division. Four persons are engaged in supply. All this, of course, is within the limits of the planned wage fund. But if a financial inspector comes to check, Kotov will be punished, for the conditions of temporary collectives allow only scientific and engineering personnel to be kept on the staff.

Anatoliy Semenovich Alekseyev explained to me: the institute attempted on a legitimate basis temporarily for the period of work of Start to increase the number of workers of the supply division by three, for the volume of work of the division made up of four people doubled after Start was created. They addressed a request to the union Ministry of Finance, since it was a matter of increasing the number of the notorious strictly limited administrative and management personnel (AUP). They received the response: "The ministry does not object." To whom and about what does it not object? It turned out that it did not object that we begin writing: to the Presidium of the Siberian Department of the Academy of Sciences, it--to the RSFSR Council of Ministers, and from there--to the union Ministry of Finance with a request to allocate three additional units. But it is shameful to force the presidium to appeal to the central organs over three workers with salaries of 110 rubles each. But all the same, how is it possible to hire at our own expense three supply workers who are needed at that time as air is? No way. "Snowdrops," who are registered in other positions, also appeared in this way in Start. But why, strictly speaking? Is it not more visible to the manager of the collective, whom it is better to have for work at a given moment on his staff?

The picture is the same with holders of more than one job. The temporary collectives were given an advantage: in cases of necessity they are permitted to attract specialists through the combining of jobs. Taking into account the tight deadline allotted to the work, this seems quite legitimate. However, the combining of jobs is permitted only "in accordance with established procedure." Practical experience has shown: "established procedure" means the collection of not less than 6-12 permits in order to hire the holder of more than one job. From 2 to 6 months are spent on this. But at times Start needs a holder of more than one job for only a month!

I foresee an objection: for such a period throughout the national economy they do no hire a specialist through the combining of jobs, but conclude a labor agreement with him for the performance of a specific job. True. But it is possible to pay for the work in accordance with the labor agreement only from the solitary fund. Temporary collectives, inasmuch as they are not permanent organizations, are not usually allocated such a fund. Therefore, on the one hand, they are granted the right to effectively attract outside workers, but, on the other hand, it is very hard for them to utilize this right in practice.

This problem is particularly urgent in the collective now, when the stage of developing the concept has been succeeded by the stage of assembling the real

item, whose buttons can be pushed. The hands of designers and engineers, whom you will not find by any means in the academic institute, make the real item and solder boards.

The question arises: Why, strictly speaking, are these restrictions on the temporary collective needed, if the overall limit--the maximum amount of assets for the remuneration of labor, which the collective over the entire period of its existence--has been established for it? If Kotov exceeds it, there is no place to get any more, his people and he himself will be without a wage. If an unspent "balance" remains, they will not withdraw it anywhere. It is envisaged that if they complete the theme by more economical means, it will be possible to spend the balance of the wage fund on giving incentives to the participants in the work after its completion. So that the collective also has no reason to squander money.

Under these conditions why do we need directives and prohibitions from outside, which regulate whom it is impossible or impossible to pay for what, how much, and on what basis? For, in essence, the entire temporary collective works on a collective contract with the state. Currently the wage and increment fund here is into the hands of the brigade leaders. They are told: here are your assets, and here is your portion of the task. Will the collective of the brigade really not understand what it is to do with its own hands and when, but where it makes sense to attract an outside skilled craftsman, having shared with him a part of the brigade wage?

I cite these examples in order to emphasize: THE FLEXIBLE FORM OF ORGANIZING THE RAPID CONDUCTING OF RESEARCH REQUIRES DIFFERENT, FLEXIBLE SOLUTIONS, WHICH INVOLVE THEIR SURVIVAL.

Start. This brief name of the country's first temporary scientific collective is profoundly symbolic.

First, this is the beginning of work on the concept of computers of a new generation.

Second, it is the discovery and development of a new promising form of the rapid conducting of scientific research, a unique organizational, economic, and social experiment, which in a short time has convincingly demonstrated its indisputable advantages.

Third, it is reminiscent of a short-distance runner, who immediately after the pistol shot picks up rapid speed.

The speed picked up by the Novosibirsk Start is very fast. The obstacles which have emerged in its way should be eliminated. Its experience and difficulties suggest that it is time for the USSR State Committee for Science and Technology together with other concerned departments to critically review the documents regulating the activities of temporary scientific and technical

collectives, which have been created to solve the most important intersectorial problems.

Time does not wait.

2384
CSO: 1814/124

URAL SCIENTIFIC CENTER

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 5, 3-16 Mar 87 pp 1, 4, 7

[Article by F. Vladov and A. Tyagny-Ryadno (Sverdlovsk): "The Life of a Scientific Center"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] F. Vladov and A. Tyagny-Ryadno make press photographs in Sverdlovsk. Pages 4-7.

The unique abundance of natural resources together with the development of powerful industry has turned the Urals into one of the leading economic regions of the country. Now, during the period of reorganization, it is especially important to place the further development of this region on a solid scientific foundation, which guarantees the achievement of high end results.

The academic institutions, which since 1971 have been united into the Ural Scientific Center of the USSR Academy of Sciences, constitute the heart of Ural science. Today in the assets of the Ural Scientific Center there are 15 large scientific institutions, at which nearly 4,000 scientific associates, among whom there are 5 academicians and 15 corresponding members of the USSR Academy of Sciences and more than 170 doctors of sciences, work.

Now additional acceleration is being given to Ural science: the question of transforming the scientific center into the Ural Department of the USSR Academy of sciences is being decided at the field meeting of the Presidium of the USSR Academy of Sciences.

New technologies of preparing the surface of metals which are hard to strain have been developed at the Institute of Electrochemistry of the Ural Scientific Center jointly with the Ural Polytechnical Institute imeni S.M. Kirov. Their essence lies in the preliminary application of lubricating metallic coatings made of fused salts on the surface of the blanks.

In the photos [photos not reproduced]: [p 1, top] President of the USSR Academy of Sciences Academician G.I. Marchuk and Chairman of the Ural Scientific Center of the USSR Academy of Sciences Academician G.A. Mesyats during the meeting; [p 1, bottom] junior scientific associate S.M. Perin,

senior scientific associate Candidate of Chemical Sciences T.I. Manukhina, and junior scientific associate G.N. Shardakova, staff members of the corrosion laboratory of the Institute of Electrochemistry, discuss the results of an experiment.

For the fourth time the USSR Academy of Sciences is holding a field meeting in Sverdlovsk. In 1932 the Ural Affiliate of the academy was established, while in the difficult year of 1942 a session, which was devoted to the mobilization of scientists for the elaboration of urgent problems of science under wartime conditions, was held precisely here. Then in 1971 the affiliate was transformed into a scientific center, and, finally, today the question of the organization of the Ural Department of the USSR Academy of Sciences is being settled.

The field meeting was held on 5-6 February in the large hall of the House of Political Education of the Sverdlovsk Oblast Committee of the CPSU. Representatives of central and regional party and state organs, the most prominent scientists of the country, workers of sectorial and VUZ science, and workers of industry were present here. Chairman of the Ural Scientific Center Academician G.A. Mesyats delivered the main report "The Tasks and Prospects of Development of the Ural Department of the USSR Academy of Sciences."

In the photos [photos not reproduced]: [p 4, left] the field meeting of the Presidium of the USSR Academy of Sciences is under way; [p 4, middle] Member of the CPSU Central Committee and First Secretary of the Oblast Party Committee Yu.V. Petrov.

In greeting those who had gathered, First Secretary of the Sverdlovsk Oblast Committee of the CPSU Yu.V. Petrov said: "Today at a truly critical revolutionary stage of the development of the country, perhaps, as never before, the need for scientific ideas, discoveries, and recommendations has objectively increased. We regard the decision on the establishment of a new department as a great advance and great confidence in the scientists of the Ural Region on the part of the CPSU Central Committee, the government, and the Academy of Sciences. On our part we have supported and will support scientists in resolving all questions and problems. And our main work, of course, is ahead."

An exhibition of the achievements of academic science of the Urals was spread out in the foyer of the House of Political Education. Much attention during its preparation was devoted to the exhibits which reflect the close contact of science and production. The advanced technologies, original equipment, new materials, unusual coatings, and other promising developments reflected the urgent directions of work of the scientists of the region. On their recommendations in 1986 alone 217 proposals were introduced with an large economic impact.

In the photo [photo not reproduced]: [p 4, left] Academician G.I. Marchuk inspects the exhibition.

"The mineral wealth of the Urals is well known. But if you look at a geological map with the plotted mineral deposits, it is evident: the Middle

and Southern Urals have been studied well, something has been discovered in the Northern Urals, but between the Middle and Northern Urals there is an enormous area of practically unexplored territory. Moreover, even in the studied regions we know only what lies on the surface and near it. Deep deposits for the present are still an enormous field of activity for geologists," V.A. Koroteyev, director of the Institute of Geology and Geochemistry imeni Academician A.N. Zavarnitskiy, says.

In the photo [photo not reproduced]: [p 7, left] Doctor of Geological Mineralogical Sciences V.A. Koroteyev shows the undeveloped regions on a map of the Urals.

To obtain resources where they were previously lost--such tasks are facing specialists more and more often. Scientists of the Institute of Metallurgy proposed an integrated technology of the processing of copper-nickel ores. A single-stage autogenous process was used instead of traditional multistage conversion. Having replaced in addition silicate additives with lime additives, they were able to obtain from the slags of copper-nickel production a large amount of iron, which previously in practice was not extractable.

In the photo [photo not reproduced]: [p 7, middle] G.P. Popova and V.P. Maryevich, staff members of the Institute of Metallurgy, make measurements on a unit for studies of the kinetics of heterogeneous interactions.

It is proposed to transform the recently organized Ural Affiliate of the Institute of Machine Science imeni A.A. Blagonravov (UFIMASh) into an independent subdivision which is a part of the Ural Department of the USSR Academy of Sciences.

In the photo [photo not reproduced]: [p 7, right] engineers A.Yu. Obrezkov and A.K. Svechnikov adjust one of the sections of the flexible production system for the designing and production of printed circuits, which was developed at the institute.

7807
CSO: 1814/125

UDC 001.83:338.4 (047)

PLANNING, MANAGEMENT OF SCIENTIFIC PRODUCTION ASSOCIATIONS

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 2, Feb 87 pp 67-77

[Article by Candidates of Economic Sciences K.P. Kedrova, B.M. Rudzitskiy, and P.A. Sedlov and Candidate of Technical Sciences T.L. Sletova under the rubric "The Organization and Effectiveness of Scientific Research": "Scientific Production Associations: Planning, Financing, Management"; passages within slantlines published in italics]

[Text] At the conference in the CPSU Central Committee on questions of accelerating scientific and technical progress on 11 June 1985 General Secretary of the CPSU Central Committee M.S. Gorbachev noted: "It is very important to give new impetus to the development of a network of large-scale scientific production associations. They are called upon to become real outposts of scientific and technical progress."(1)

Indeed, scientific production associations [NPO's] help to eliminate the organizational isolation of developers of new equipment, to ensure the continuity of scientific and technical progress, and to involve designers, planners, process engineers, and production workers more actively in the developments of scientific and technical ideas right from the stage of basic research. The opportunity to orient the system of planning, evaluation and stimulation more completely toward the improvement of the end results of production and to integrate the chain of intermediate works is appearing. These advantages are transforming NPO's into an effective channel, via which the results of basic research "are brought up" to production more rapidly.

Practice show that under the conditions of NPO's the research-production cycle is shortened significantly, the number of developments introduced increases, and the share of output produced with the State Emblem of Quality rises. Thus, at the Tulachermet NPO the number of developments introduced in 5 years increased by 2.3-fold, the economic impact increased from 0.9 to 4.4 rubles per ruble of expenditures.(2) The positive experience of the VNIImetmash NPO, where the economic impact from introducing developments during the 10th Five-Year Plan exceeded 370 million rubles while the time of assimilation of fundamentally new equipment was shortened to one-third to one-half, is also well known.(3)

On the order of the USSR State Committee for Science and Technology [GKNT] the means of improving the economic organizational mechanism of scientific production associations were studied in the sector of the management of scientific and technical progress of the Economics Institute of the USSR Academy of Sciences. The results of the work were discussed at a special conference in the GKNT with the participation of representatives of scientific production associations. Several results of the conducted study are also described in this article.

A Typology of NPO's and the Formation of Their Production Base

The task "to expand the network of scientific production associations, aiming them at the development and extensive introduction of new generations of equipment and technological complexes and the continuous improvement of equipment and production technology" is posed in the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000."(4)

The task of the development and extensive introduction of new equipment and technology presupposes the inclusion within the NPO of a sufficiently powerful works, without which it is impossible to ensure the extensive introduction of new items and technology. In our view, however, one should approach the formation of the production base of the NPO in an individualized manner, on the basis of the specific role that the association should play in scientific and technical progress. In conformity with this role NPO's can be divided into three types.

1. Scientific production associations with a complete scientific production cycle, which develop and produce custom-made single-design equipment and instruments, as well as small batches of products of increased complexity. These associations supply products to the user with the fulfillment of all the installation and start-up and adjustment operations which ensure the preparation of the equipment for industrial use.

2. Scientific production associations, which develop and produce technological systems and and means of the mechanization and automation of production and management. These associations should take part in the preparation and use of their products by the client, that is, perform start-up and adjustment operations. It is also necessary to carry out by the forces of these NPO the training of the personnel who will service the equipment during operation. These NPO's differs from associations of the first type by the series nature of the final product and the scale of introduction.

3. Scientific production associations, which are engaged in the development of products of mass use. The NPO's of this type are called upon to develop new products and the technology of their production, to assimilate the industrial production of items, and then to turn over the documents, accessories, and technology to other plants for the organization of series and mass production in volumes that make it possible to satisfy the needs of the national economy. Engineering brigades of the specified NPO's take part in the assimilation of the series output of the new products by production associations and individual enterprises. Several stable industrial series and

technical assistance to other enterprises in the assimilation of the new products will be the final product of such NPO's.

The production capacities of the scientific production associations of the first two types should be sufficient to meet the planned needs of the national economy for their final products. Special subdivisions, which carry out contract supervision at the users should exist in the associations.

Scientific production associations of the third type need such production capacities, which would fully support pilot experimental operations, the production of accessories, and the output of several stable industrial series.

The capacity of scientific research institutes [NII], design bureaus [KB], and pilot experimental subdivisions of scientific production associations should be sufficient for the updating of the products of the NPO's themselves within the standard time, as well as for the organization of the assimilation of new items by production associations and individual enterprises in accordance with the developments of the NPO.

The use of the capacities of NPO's for the present is in many respect being checked by shortcomings of their economic organizational mechanism. The improvement of the planning, financing, and organizational structure of the management of NPO's would in many respects contribute to the acceleration of scientific and technical progress.

The Planning and Evaluation of the Work of NPO's

One of the basic factors, which reduce the contribution of NPO's to scientific and technical progress, is the absence of unity in their planning, financing, and economic stimulation. This has been caused primarily by the inclusion of NPO's simultaneously in two different sectors of the national economy--"industry" and "science and scientific service," of each of which its own formed system of planning, financing, and stimulation with its own specific tasks is characteristic. The personnel of the scientific subdivisions are interested first of all in the "introduction," even though formal, of new equipment, that is, in beginning its output irrespective of the volume of this output. The fulfillment of the plan on the output of products, the increase of labor productivity, and many other economic indicators first of all interests production workers. Consequently, they are not interested in introducing scientific and technical measures that do not provide an obvious increase of commodity production or a reduction of the production costs during the period under review. The plan of introduction, however, does not bind them to this. The association's activity has become "dual"--the connection of science with production becomes complicated.

In accordance with the prevailing statute the central place in the plan of NPO's should be assigned to research and development. The plans of production, financing, capital construction, and material and technical supply should be formulated so as to completely support the thematic plan, while orders for the series production of previously assimilated products should be relegated to second place. In practice everything is different. A survey of a number of NPO's showed that the ministries are violating established

procedure. The NPO's are receiving assignments, which are not interconnected, on the plan for the development of science and technology and on the production of series output. A new product, which has been assimilated at the NPO, is not turned over to other enterprises, but is attached to the association, utilizing the production capacities of not only series, but also pilot production.

The separate planning and finance of the various stages and phases of the operations of the unified cycle have the result that the plan of an NPO is often the sum of the plans of the structural units, which are poorly coordinated with respect to time and the provision of resources. This creates disproportions between scientific and production capacities and has a negative effect on the process of developing new equipment and the time of its introduction. For example, indicators of the growth of labor productivity, the profit, and the volume of commodity production are established for the plant and pilot works, which belong to one association. As a result a plan on the products list, which hinders the production of the new items envisaged by the plan of the development of science and technology, is often formulated.

In essence, the set of economic indicators of the planning and evaluation of the activity of NPO's mechanically copy the sets of indicators of sectorial scientific research institutes and cost accounting indicators of industrial enterprises with all the ensuing contradictions between current production tasks and the long-range needs of the technical development of the sector and the national economy as a whole. The volume of the output of new and previously assimilated series-produced products in value terms, as well as the value of prototypes and test runs of items and materials, which are manufactured at the expense of the fund for the assimilation of new equipment or the unified fund for the development of science and technology, are included in /the total volume of sold output/.

An essential drawback of the use of the indicator of the volume of sold output for planning the activity of NPO's is that it does not take into account the exploratory and scientific research work, which is aimed at the creation of the necessary reserve, although its proportion in the total volume of an association's operations should be sufficiently great. Thus, the indicator of the volume of sold output, which is approved by a superior organization, orients NPO's to a significant degree toward the increase of the volume of output of series-produced products, and not toward the development and assimilation of new highly efficient equipment and technology.

The /gross output/ also includes the entire set of operations being carried out, including unfinished production, the results of which for the present do not have a use value. Therefore, such an indicator cannot serve as an objective measure of the meeting of the real social needs for new equipment. It is advisable to use it only for accounting purposes.

The indicator of the volume of commodity production also does not reflect the real picture of the activity of NPO's--the significant amount of scientific activity is not taken into account in it.

The use of the profit as the basic indicator does not completely correspond to the purpose of NPO's, since given the existing price system it is simpler to derive a profit from production activity by increasing the output of previously assimilated products and increasing the prices of new ones than by constantly updating the production program.

The planned indicators of the increase of labor productivity and the profitability also do not orient NPO's toward the technical modernization of products, since the assimilation of new equipment inevitably requires increased expenditures of labor and materials. Thus, none of the indicators used in industry can reflect the specific nature of the activity of NPO's and orients associations toward the acceleration of scientific and technical progress. In accordance with the decree of the CPSU Central Committee and USSR Council of Ministers "On Measures on the Acceleration of Scientific and Technical Progress in the National Economy"(5) the planning of the activity of a number of NPO's solely according the sector "science and scientific service" was introduced in five sectors of industry as an experiment. But such a transition can deprive the association of the technical base of series-producing plants, only at which it is possible to carefully develop production technology. A weighty argument in favor of preserving the existing "dual" planning procedure for many NPO's is the task facing such associations to be in charge of the output of equipment on the sectorial scale and to ensure the quickest retooling of production.

With respect to the indicator of the completeness of the scientific production cycle all NPO's can be broken down into three groups. The first includes associations, which develop and manufacture single-design equipment and instruments in accordance with special orders, as well as small batches of products of increased complexity. The end result of the work of such NPO's is the delivery of products to the consumer with the fulfillment in so doing of all the work (start-up and adjustment, regulation, and others) on preparation for industrial use.

The second type of NPO's is made up of associations, which develop technological systems and means of the mechanization and automation of production and management. Such NPO's, as a rule, themselves introduce their developments at enterprises of the sector and outside it. Their production capacities enable them to satisfy the corresponding needs of the national economy almost completely. Their final product is equipment, which has been turned over "turnkey" and has been paid for by the client. The nature of the final product and the scale of its introduction distinguish these NPO's from the first group.

NPO's with an incomplete scientific production cycle, which are engaged developing products of mass use, belong to the third type. Such NPO's should develop only new models, manufacture test runs and the first series of products, and then turn the developed technical specifications over to other series-producing plants for the organization of series and mass production in volumes which make it possible to meet the national economic need. The trial or first commercial series will in this case be the final product of the NPO's.

Such a classification makes it possible to specify more precisely the efficiency functions of NPO's within the sectorial division of labor. At the NPO's of the first two groups the capacity of their own series-producing plants should be sufficient to completely satisfy the needs of clients for the corresponding product. At NPO's with an incomplete cycle the capacity of their own series-producing plants should be sufficient only for the output of the trial and commercial series of new products of mass use--it is hardly advisable to include many series-producing plants within them. Form them, apparently, it is better to preserve the procedure of planning in accordance with the sectors "industry" and "science and scientific service," having envisaged a mechanism for transferring developed technical specifications to plants of the sector for mass production; to extend the terms of the single supply order or to permit an association to conclude direct economic contracts with enterprises within the framework of the comprehensive scientific and technical program of the ministry and in so doing to use the economic mechanism of contractual obligations on deliveries of products.

As the basic object of planned management it is necessary to take not individual jobs and stages, but the entire scientific production cycle, and to use the indicator of the final product, which is specific to the given type of NPO's as the generalized volume indicator. The all-union and sectorial scientific and technical programs of the development and introduction of new equipment and technology and exploratory scientific research, which is aimed at the development of the association's scientific production potential, then constitute the core of the comprehensive five-year plan of the scientific and technical development of the association. On their basis it is necessary to draft the first, thematic section of the comprehensive plan, and then, on the basis of the assignments of this section, the other sections. The plan of the production and sale of products, the retooling of internal production, standardization, and the improvement of the management and organization of production, the plan on labor and personnel, and the plans of financing and material and technical supply and of environmental protection are grouped with them

It is advisable to reduce the number of approved indicators of scientific production activity in the plan. In our view, the assignments of the scientific and technical programs and the assignments on the production of new and the most important types of series-produced products, which correspond to the specialization of the NPO should be approved by the superior organization. The association can specify for itself the indicator of the volume of sold output.

It is also advisable to switch to the standardized method of planning the wage fund and to specify it for the 5-year period, based on the total number of scientific production personnel as a whole, without division into scientific and production activity. Here, first, the opportunity appears if necessary to redistribute the assets of the wage fund between the scientific and production subdivisions; second, the need for manpower resources is determined more precisely. It is also necessary to determine on a standardized basis the number of administrative and management personnel. As far as profit is concerned, under the conditions of NPO's it is advisable to plan it only from the sale of industrial products. The remaining components of the profit of

NPO's from scientific and technical activity (planned accumulations and the excess of revenues over expenses) do not reflect the real national economic impact.

Thus, it is advisable to group the following with the basic indicators and standards, which are approved by the superior organization.

For scientific production activity: the assignments of all-union scientific and technical programs; the production of new and the most important types of series-produced products in value and physical terms with the indication of the quality indicators; the assignments of superior organizations on conducting the most important research and development;

For labor: the standard of the wage fund of scientific production personnel per ruble of work which is performed on their own; the standard of allocations for the pay of administrative and management personnel per ruble of performed work; the standards of the formation of material incentive funds and funds for sociocultural measures and housing construction.

For finance: the profit from the sale of industrial products; the amount of expenditures on the work being performed, the sources of financing (the Unified Fund for Development and New Equipment--YeFRNT, receipts from economic contracts, the state budget, and others); payments to the budget.

For capital construction: the limit of centralized capital investments with the singling out of the amount of construction and installation work; the standard of the formation of the development fund of the NPO.

For material and technical supply: the volume and range of deliveries of raw materials, materials, equipment, and components, which are distributed by the superior organization.

The limitation of the set of indicators and economic standards will enable the superior organization to manage both the scientific production and the financial activity of the NPO, without restricting its initiative in internal economic planning, the technical improvement of production, and social development. It is advisable to afford associations the opportunity to specify themselves the indicators, which are necessary for the internal economic planning, evaluation, and accounting for all types of activity. A portion of the indicators can be approved by the association's management as mandatory indicators, and the other portion can be used to analyze the efficiency of activity and can be of an estimated nature.

The Improvement of the Mechanism of the Financing of NPO's

The fact that in the plans it is often necessary to take into account not so much the need of industry for new developments as the availability or lack of of sources of financing, has an adverse effect on the activity of NPO's. If the approved plans of the development of science and technology are not backed by the corresponding sources of financing, then the fulfillment of individual stages of the research-production cycle is delayed. The mechanism of financing scientific and technical operations is not tied to the mechanism of

the special-purpose material stimulation of the direct participants in the development, production, and assimilation of new equipment. In essence, there are no stimuli for reducing expenditures in the research-production cycle. Cost accounting financial forms (internal assets and credit assets) are being used poorly for making advances for scientific and technical operations and especially operations on the assimilation of the production of new equipment. Thus, the creation of an integrated system of financial support of the activity of all subdivisions (scientific, design and technological, and production), which envisages the fundamental interconnection and interaction of all forms of financing and ensures the balanced development of the scientific and production potentials at scientific production associations, is of fundamentally great importance for increasing the efficiency of the work of NPO's.

The methodological basis of the integrated system of financing is the orientation of all its components toward a unified "comprehensive" goal that is common to all structural subdivisions of the scientific production association. The achievement of this goal should also be the main objective of financing over the entire cycle of operations--from research to the assimilation of the production of the first commercial series runs of new types of equipment. The unified mechanism of such financing should unite the special-purpose assets of the budget, the assets of the YeFRNT, the assets from the development fund of the NPO, the monetary assets received in accordance with economic contracts from other organizations for performed research and development, as well as credits of the State Bank and the All-Union Bank for Financing Capital Investments. It would be advisable also to change the procedure of deductions for the YeFRNT--the basic form of comprehensive financing of the research-production cycle--and to tie this procedure with the real contribution of the given association to scientific and technical progress. For this a progressive scale of deductions from profit from the sale of the product subject to of the level of the scientific and technical novelty of this production should be introduced. Then beginning with the 3d-4th year of the output of the product the association would make substantially higher payments to the YeFRNT, which would be an effective financial and economic lever of the acceleration of the assimilation of the output of new equipment. The scale of progressive deductions and the standards and rate of their increase should take into account the specific nature and pace of technical progress in the given sector. A sample table of deductions from the profit by years of output (as a percent of the volume of commodity production) could have the following form.

Group of products	Amount of deductions by years of series production, percent					
	I	II	III	IV	V	VI
Fundamentally new products assimilated for the first time in the world.....	0	0	2	3	3	5
Products assimilated for the first time in the USSR.....	0	0	3	3	5	8
Other products.....	3	3	8	8	8	8

Such an approach would promote not only the rapid updating of the output being produced, but also the increase of the assets of the special-purpose fund itself.

The system of financial benefits to an association that is actively participating in the technical development of sectors and the entire national economy would make it possible to create more powerful stimuli to the rapid updating of products. The procedure of allocating assets from the YeFRNT for financing scientific and technical operations of an association should also be revised. Today these assets are made available by the ministry that distributes them to the associations in a centralized manner in accordance with the financial plans and estimates of expenditures on the performance of scientific and technical operations. Apparently, it is more advisable to establish a long-range standard of the financing of research and development and production operations on the assimilation of the production of new equipment at the expense of the assets of the sectorial YeFRNT and to leave these assets at the disposal of the NPO. This will make it possible to increase the creative initiative and interest of labor collectives in the more efficient use of special-purpose financial resources. In our view, this standard should complete ensure the financing of all planned operations on scientific and technical development.

The creation of the unified development fund of the NPO, which, besides the assets envisaged by the statute on the formation of the development fund, would include the additional special-purpose assets for the technological preparation of production, the assets allocated in accordance with the estimates of capital construction, as well as all amortization deductions, would be of no small significance for strengthening economic organizational unity. Here it is advisable to amortize the equipment used for research and development and to include it in the unified development fund of the NPO. It would be advisable to channel the deductions from markups (up to 30 percent) on the new highly efficient products being produced by the association entirely into this fund.

Assets for financing unplanned scientific and technical operations, which are performed in the interests of the NPO and the need for which arose after the approval of the five-year and annual plans, should also be envisaged within the unified development fund of the NPO. These assets can be formed into a permanent and transient "reserve" fund and be used to cover expenses which involve an increased scientific, technical, and production risk, especially during the development and assimilation of the production and the introduction of fundamentally new equipment.

It is also advisable to establish a procedure of material stimulation for the increase of the effectiveness of use of special-purpose monetary assets and for the decrease of the expenditures in the research-production cycle, which are financed at the expense of assets of the YeFRNT on the basis of the establishment of a scientifically sound set of standards of expenditures throughout the entire research-production cycle.

The flaws in the existing mechanism of financing NPO's stem to a certain degree from the flaws in the organization of the recording of expenditures and

in the imperfection of reporting on all types of activity of the structural subdivisions of the NPO. The existing forms of recording expenditures--on scientific and technical measures, on the output of new products, on the output of assimilated products, and on capital construction--do not make it possible to make a complete evaluation of the qualitative aspect of financing, which is connected with scientific and technical progress, and to establish the exact ratio of expenditures by stages of the research-production cycle.

The presence within the NPO of diverse structural units makes analytical accounting and reporting substantially more complex, since the forms of reporting on the scientific and production components often include incomparable and irreducible indicators. At the same time the presence of two relatively independent plans at the NPO leads to an inordinate increase of the volume of accounting work and reporting documents.

In practice accounting services draw up two reports (for scientific and production activity) with duplicate completion of different forms (170 forms, of them about 70 on scientific activity and about 100 on production activity).

If the the summary order form of accounting, which not exists at the NPO and encompasses only production activity, is supplemented by the summary orders "Expenditures on Scientific Research, Experimental, Planning, and Design Operations," "Expenditures on the Preparation of Production," "Expenditures on the Assimilation of the Series Production of New Equipment or Technology," and "The Actual Economic Impact of New Equipment," it will be possible to form a comprehensive interconnected system of recording of expenditures and the results of scientific and technical measures and thereby to create the conditions for the more effective and purposeful use of the financial resources of the association.

The Improvement of Economic Organizational Structures

It is obvious that the unified procedure of planning and financing the work of an association should be based on the comprehensiveness of the structure of the NPO and on a unified, "comprehensive" management system that equally encompasses all stages of the scientific production cycle and all structural subdivisions: scientific research institutes, design bureaus, enterprises. Under the conditions, when the same administrative functions are dispersed among different structural subdivisions, while the few existing functional services operate independently of one another and are little capable of affecting the administrative decisions of the managers of the subdivisions, no change in the procedure of planning, financing, and accounting will achieve the goal and ensure the unity of science, technology, and production policy on the scale of the NPO.

It is also obvious that it is impossible to suggest any single system of management of NPO's. The differences between NPO's with respect to the nature of their final product have already been spoken about above. There are also other, no less important differences--in sizes, organizational affiliation, and so forth. So that here, perhaps, it is more appropriate to speak not of specific organizational management structures, but of the principles of their selection and designing.

The most common of such principles is the increase of the role of "comprehensive," functional management, which encompasses specific types of activity over the entire scientific production cycle in all units. This means the consolidation of functional services of various types and the giving to them of a higher status, particularly the transfer to their managers of many management decisions on the scale of the entire association.

When determining the scale, status, and powers of such services it is necessary to consider that in a number of cases they should not only serve the needs of the association itself, but also--within the limits of the specialization of the given NPO--ensure the pursuit of a unified science and technology policy in the subsector or even in the sector as a whole. For this purpose base services of feasibility studies, scientific and technical information, patent and licensing work, the scientific organization of labor, standardization and unification, and the development of labor and material standards have been created in some NPO.

Specific problems arise when determining the size of various structural units. It seems to us that here it is most appropriate to proceed from the capabilities of scientific research institutes. If the capacity of scientific research institutes and design bureaus is greater than that of enterprises, they will have to seek "on the side" orders that are not connected with the theme and specialization of an association, and, despite the common system of planning and finance, the interests of different units of the NPO will come into conflict.

The management of an NPO consists of general supervision, which is implemented at the level of the association as a whole and its individual structural units, and a functional management. It is advisable to assign to the system of functional management in the NPO the organization of an integral system of management, forecasting and planning, the organization of research and development, the management of the scientific and technical development and technical preparation of production, and the coordination and operational management of pilot production. The management of manpower, material and technical, and financial resources, repair, transportation, and other types of service, the modernization and expansion of the NPO, the socioeconomic development of the collective, and so forth could also be within its competence.

The designing of the functional management system should be based on a clear understanding and formulation of the entire set of goals and tasks of the given NPO. After the main goals--scientific and technical, production, economic, social--are formulated, it is necessary to detail each of them as a hierarchy of subgoals (a tree of goals). At the next entails an analysis of the functions of the management system on the achievement of each of the goals is made. The result of the analysis is a hierarchically ordered set of functions, which can also serve as the basis of the formation of the management system. Then the necessary number of levels of the hierarchy, the number of subsystems and their interrelations at each of the levels, and the principles of the interrelation of these subsystems in a unified management system can be specified. The procedures of such a functional analysis and the

designing of horizontal (by functions, problems, and so forth) and vertical (by levels of the hierarchy) structures of a management system as applied to large scientific and technical organizations has been studied and described quite thoroughly in the literature on the theory and practice of scientific management.

One of the possible forms of such an interconnection is a matrix-type management system, which makes it possible to coordinate the actions of functional and problem structures.

The goal program approach makes it possible to unite the most diverse types of management structures in the management system of the NPO. For example, permanent integrated groups, which are subordinate to the project supervisor and participate in the work until the project is completely finished, could become the basis of the organizational structure of an association, while the other subdivisions and performers can be enlisted in the work on specified stages of the project. In this case many leading specialists receive the opportunity to work simultaneously on several projects in the "time-sharing" mode, which is specified by the network schedules.

Of course, such a reorganization of management requires a sharp increase of management standards, as well as the coordination of the interests of different units of the NPO (to a significant degree the changes listed above in the procedure of planning and financing are also oriented toward this). All these are complex tasks whose accomplishment requires long-term work. But NPO's, which are called upon to be the main bearers of scientific and technical progress in the national economy and to ensure the rapid development of the key sectors in the scientific and technical respect, should themselves also use the most advanced methods of organization and management, which corresponding to their large-scale and comprehensive tasks.

FOOTNOTES

1. M.S. Gorbachev, "Korennoy vopros ekonomicheskoy politiki partii. Doklad na soveshchanii v TsK KPSS po voprosam uskoreniyu nauchno-tekhnicheskogo progressa 11 iyunya 1985 g." [A Vital Question of Party Economic Policy. Report at the Conference in the CPSU Central Committee on Questions of the Acceleration of Scientific and Technical Progress on 11 June 1985], Moscow, Politizdat, 1985, p 21.

2. V.G. Smirnov, V.G. Kornikhin, "Methodological Aspects of Management and the Practice of the Operation of Scientific Production Associations," ELEKTROTEKHNICHESKAYA PROMYSHLENNOST. SER. OBSHCHEOTRASL. VOPR., No 2 (525), 1983, p 1.

3. V.A. Kotlov, "The Improvement of the Forms of the Organization of Industrial Production Under the Conditions of Scientific and Technical Progress," VESTNIK MASHINOSTROYENIYA, No 3, 1985, p 70.

4. "Materialy XXVII syezda KPSS" [Materials of the 27th CPSU Congress], Moscow, Politizdat, 1986, p 282.

5. SP SSSR, No 24, 1983, pp 419-425.

12794
CSO: 8144/3707B

CRITICISM OF PATENT EXAMINATION SYSTEM DRAWS RESPONSES

Moscow IZVESTIYA in Russian 21 Jan 87 p 2

[Article by IZVESTIYA special correspondent A. Ivakhnov under the rubric "The Correspondence Round Table of IZVESTIYA": "The Technical Idea on the Scales of Examination"; first three paragraphs are IZVESTIYA introduction; last two paragraphs are IZVESTIYA conclusion]

[Text] The responses to the publication "Nuggets in the Wastepaper Basket" (No 342, 1986) are flowing to the editorial board like a wide river.

Let us recall that in it the work of the experts of the All-Union Scientific Research Institute of State Patent Examination was criticized and questions of the careful auditing of the technical solutions, which are now covered with archive dust, and the organization of the extensive introduction of those of them, which can serve today the acceleration of scientific and technical progress, were posed. Practically every letter contains instructive examples and valuable suggestions on the reorganization of invention in the country.

Not only inventors, but also workers of the State Committee for Inventions and Discoveries, including experts, responded to the publication. They have, of course, their own opinion of the problems which were posed by the newspaper. We are giving both the floor.

In the Opinion of Inventors

One of the most sore subjects of invention: the difficulties in the way of the recognition of a technical idea as an invention, was touched upon in the published letters. Even experienced innovators far from always succeed in drawing up applications, which satisfy all the requirements of the instructions, in producing prototypes of innovations, and in making independently a patent search, while many cannot afford to pay for this work, which is performed by a specialized organization. Far from every expert will willingly help an inventor to refine the formula of an invention and will explain in a friendly manner to the author of the application his errors. Correspondence with the All-Union Scientific Research Institute of State Patent Examination drags on for many years. Many people, who are capable of creative technical work, for these reasons are ceasing to engage in invention.

Candidate of Technical Sciences S. Bunin (Kiev):

I submitted 10 years ago an application for a new radio device. After lengthy correspondence with the expert commission I decided to abandon further claims for an inventor's certificate. Instead, I published the idea in the 1978 edition of my book "Spravochnik korotkovolnovika" [Handbook of the Shortwave Radio Operator]. Now I open an American radio engineering journal for October 1986 and read an advertisement on the latest transceiver. I look at the circuit and see: it is the same as my invention.... There can be no complaints against the Americans--the circuit was published in the open press and is not protected by an inventor's certificate. But is it not really insulting that an idea, which was proposed in our country 10 years ago, has been implemented across the ocean and a firm is deriving income from it?

A. Baybikov (Moscow):

I, an inventor with 25 years of service, who graduated with distinction from the Higher Patent Courses, a doctor of technical sciences, and the author of many articles and monographs, have not had one application go through without two or three, and more often a larger number of rejections, with the delay of the issuing of inventor's certificates literally for years. I am convinced: the greater the scale of an invention and the more original it is, the greater the aspiration of the expert commission to turn the applicant down. Not only my experience confirms this. It is sufficient to go through the pages of the journal IZOBRETATEL I RATSIONALIZATOR, in which examples of flagrant delays, literally for decades, of the most important inventions are cited.

M. Medvedev, author of 72 inventions (Bryansk):

At the All-Union Scientific Research Institute of State Patent Examination, it seems, they do not experience difficulties with proofs of the lack of a positive impact of the innovations being declared. For this the application is sent to a "competent" organization. The conclusions given at such organizations are based not on conducted tests, but on the "authority" of individual "monopolist" workers. Negative things are sought by them with passion. Then the expert commission cites the negative conclusion and shields itself with it like a screen, while the applicant does not have the opportunity to lodge complaints against such an organization.

In Defense of the Experts

There are many responses, the authors of which do not agree with the statement of the newspaper, but we read them with particular attention. It is indicative that a large number of inventors came to the defense of the All-Union Scientific Research Institute of State Patent Examination and its experts and express gratitude to them for assistance in drawing up applications. In the responses there are also many complaints against inventors themselves: several of them, having set themselves the goal to obtain without fail an inventor's certificate for a technical idea of little value, for years dispute with the experts, write complaints against them to all instances, but meanwhile could have introduced their innovation long ago

as an efficiency proposal. The patent illiteracy of many claimants to the title of inventor is also spoken about in the responses.

V. Orekhov, expert of the All-Union Scientific Research Institute of State Patent Examination (Moscow):

I read three letters on the truly important theme and was amazed at how similar two of them (of Comrade Shainskiy and Comrade Shchelkunov) are to several applications received by us. You will not determine immediately what there is more of in them--aplomb or a lack of elementary patent literacy.

Comrade Shainskiy writes that while he "argued" with the expert commission, in the FRG they patented an analogous invention and the priority of our country was lost. But priority is established as of the date of receipt of the application by the All-Union Scientific Research Institute of State Patent Examination. In controversial cases priority is established even as of the moment of the registration of the application at the enterprise.

In one of the letters there is an obvious lie--that any reader of the All-Union Patent Technical Library can use the archive collection of rejected applications. This collection has nothing to do with the All-Union Patent Technical Library, and only experts of the All-Union Scientific Research Institute of State Patent Examination have the right to take applications from it.

I want to believe that the important theme, which has been touched upon by the newspaper, will not turn into a platform for demagogues who take shelter behind the flag of reorganization.

Candidate of Technical Sciences Yu. Baryshev, deputy chairman of the Control Council of the Scientific and Technical Expert Commission of the State Committee for Inventions and Discoveries:

Only where they develop new models of equipment at the level of the best world achievements do difficulties with their protection not arise. But in the practice of the work of the Control Council one also has occasion to come across authors who attempt to invent in all areas of the national economy--from medicine to objects of space technology. Invention in their understanding is some likeness of a sports competition: who will submit more applications. Of course, without regard for their quality. Having studied all the formal demands on the examination of applications, they conduct endless disputes with the representatives of the expert commission and repeatedly change the formula of the invention. In case of a refusal to issue an inventor's certificate most often they do not intend in a technically competent manner to defend their suggestions or to refute the conclusions of the expert commission, but send complaints to many instances--"The expert commission is again hindering technical progress!"

V. Filimonov (Moscow):

I am not about to justify one side or another, anything happens--both low skills of experts and inventions, due to which one's hair stands on end. But

I would like you to take a look at what conditions the experts of the All-Union Scientific Research Institute of State Patent Examination work under.

Back in the 1970's there was an incredible lack of space in the offices, everyone lived on the hope of an impending move into a new building. So far no one has moved anywhere, there are more experts, and it has become even more crowded. In some instances, so that someone can get up from a desk, two or three staff members have to stand up.

The meeting of the expert commission and the applicants is one of the important conditions of the examination of applications. It takes place in a room not more than 30 square meters in size, where at times not less than 50 people are speaking simultaneously. A din arises, like at an airport. Now this room has also been closed--we will hope that it is temporary--the meetings take place in the cloakroom, without a desk, and people write on their lap.

I Ask to Speak

Among the received responses we, unfortunately, did not find one: an official response of the State Committee for Inventions and Discoveries to the critical letters of inventors. The committee, as is evident, does not have a ready-made solution in this regard. But the letters received by us contain many reasonable suggestions.

G. Ivanov (Tashkent):

I believe that it is necessary to convert the All-Union Scientific Research Institute of State Patent Examination to self-financing: for a fee it should make available to sectors primary information on accepted inventions and the right to become acquainted with the collection of rejected ones. Everyone will want to have such a "master" as a friend, while the "master" himself will like and cherish inventors.

Small collectives of specialists (firms) for the preliminary study of new technical ideas with the output of working models and documentation on them should also be permitted legislatively to be organized within the framework of our socialist interrelations. I am confident that such collectives of creators will be able to compete successfully with sluggish sectorial scientific research institutes.

K. Anisimov, prorector of the Kishinev Public Institute of Patent Science of the Moldavian Republic Council of the All-Union Society of Inventors and Efficiency Experts:

The primary thing is for a "wastepaper basket," in which all the "nuggets" will be buried, would not be created in the future. For this it is necessary to change radically the system of examination.

It is necessary to publish every application for an invention, on which a priority report is sent to the applicant, for general information in the

official bulletin of the State Committee for Inventions and Discoveries. Everyone, who has used a technical solution, is obliged to indicate this in statistical reports. And then the committee, both on its own initiative and at the request of interested organizations, could make in accordance with this application a full examination, taking into account the scale of introduction and the national economic value.

Such a system would make easier for experts the evaluation of the utility of declared proposals, while proposals, which are insignificant from the standpoint of practice, would not take time in vain for examination. It is necessary to publish the information on used technical solutions in the special journal VNEDRENNYYE IZOBRETENIYA. Thus, the development of technical innovations and their use would be placed under national control.

M. Saksonskiy (Togliatti):

It is not an easy thing to draw up an application for an invention. But it is possible, after all, to make it simpler.

To draw up the primary application--in one copy, without the mandatory observance of a strict format, spaces, paragraphs, and so forth. To state the essence of what is being proposed and a draft formula of the invention. The committee should accept this application and consider it at a preliminary examination. If the primary application gets through, the inventor is to be ordered to draw up the application in accordance with all the rules. If it does not, a rejection is to be sent to him with an indication of the materials being opposed. While the date of priority is to be established as of the day of the submitting of the primary application.

V. Pogarskiy (Kharkov):

The author of an application should confine himself only to a description of the invention. There are no reviews, except the certificate on the feasibility of the device developed by him. The conducting of patent research should also not be required of him--this is the job of the expert. The patent division of the enterprise is obliged to help him in drawing up the application and the formula of the invention and to keep an account of the applications which have been sent through this division. The inventor should also have the right to send applications, bypassing the patent division, if he is confident of his capabilities. In instances, when innovations originated in the process of an official assignment, he is obliged to notify the organization.

V. Svettsov, design engineer (Ivanovo):

As soon as an application has been recognized as an invention and its formula has been published in BYULLETEN, the fate of this state valuable does not interest anyone, except the author alone. But what can the author do, if it is not he who settles the questions of the application of technical ideas in the practice of production, science, and at? He becomes a tiresome intercessor, a petitioner with "selfish goals"--in short, a despicable individual.

It is necessary that in case of the issuing of an inventor's certificate the organ or sector responsible for the implementation of the new technical idea would be appointed and a specific deadline of its introduction would be established. While in case of the violation of this deadline the guilty parties would bear material responsibility to the author--for example, in the form of the payment to him of a forfeit.

E. Galustyan, scientific associate (Leningrad):

It is necessary to exclude from the reports of organizations and enterprises such indicators as the number of submitted applications and received favorable decisions. To leave only the number of introduced inventions--both "their own" and "others'." As a result the number of applications will decrease sharply, but their value will increase.

To appoint as experts specialists, who have a length of service in the given sector of not less than 10 years and have undergone certification. To establish the wage at the level of a senior scientific associate of a scientific research institute. To enlist skilled specialists of retirement age, who engaged in inventing activity, with the retention of the pension.

The regulations of the newspaper page force us to end the discussion. We will familiarize the executives of the State Committee for Inventions and Discoveries with the received mail and believe that the proposals of the readers will be valuable help in the reorganization of the work of the committee.

Inventors are an enormous and invaluable creative potential of the country, which for the present is being used too poorly. They do not want to stand aloof of the developing campaign for the reorganization of the economy of the country. And this potential must be used in full.

7807
CSO: 1814/123A

BRIEFS

SCIENCE INSTITUTES NEGLECT PATENT RESEARCH

[Editorial Report] Baku KOMMUNIST in Azeri on 16 August 1986 carries on page 3 a 1,200-word article by V. Behubudov, chief of the Baku office of the All-Union Patent Services Center of the USSR State Committee for Inventions and Discoveries, stressing the need for republic scientific institutes to seek patents for their work. He claims that "it is a pity that the role of inventions and patent licensing is underestimated at some respublic scientific research instittues, primarily at the institutes of genetics and selection, animal husbandry, planting, soil studies and agrochemistry, and the mechanization and electrification of agriculture, as well as at organizations in the ministries of motor transport, local industry, and light industry. At these places either no patent research is conducted or the research done is so superficial that doubt is cast on their patenting and competition capabilities."

COOPERATIVE OF INVENTORS--Odessa, 6 January (TASS)--The Soviet Union's first cooperative of inventors has been formed in the Black Sea port of Odessa. During their off-work hours young specialists study ways of solving technical and organizational problems falling within the sphere of their competence. They will be paid for this work after the novelty is accepted by a commission of experts. The cooperative operates on the basis of full cost-accounting. The appearance of this cooperative became possible in conditions of the present policy in the Soviet Union of encouraging work that is needed by society and is done on a collective basic during off-work hours. [Text] [Moscow TASS in English 6 Jan 86]

CSO: 1814/122

UDC 001

TASKS OF LISSR ACADEMY OF SCIENCES IN S&T PROGRESS

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 2, Feb 87 pp 50-57

[Article by Academician Yu.K. Pozhela, president of the LiSSR Academy of Sciences, under the rubric "Scientific and Technical Progress: Problems of Acceleration": "The Lithuanian SSR Academy of Sciences and the Tasks of Scientific and Technical Progress"]

[Text] The Detachment of Multinational Soviet Science

As was emphasized at the conference in the CPSU Central Committee on questions of accelerating scientific and technical progress (June 1985), the necessity of the rapid transformation of the material and technical base of production, the achievement in the shortest time of leading scientific and technical levels, and the increase of labor productivity requires the use of the results of the development of the basic sciences in production.

Experience in the introduction of the achievements of the basic sciences in production and the cooperation of scientific and production organizations of various departments to accelerate scientific and technical progress has been gained at the LiSSR Academy of Sciences.

The rule: basic research aimed at accomplishing practical tasks should have as the ultimate goal a specific outlet into practice, is in effect at the institutes of the LiSSR Academy of Sciences. The aspiration to develop the the experimental and pilot works of institutes, to use the production capabilities of interested enterprises at the culminating stage of operations, and to involve their designers and process engineers in cooperation is yielding its results.

More than 120 original electroplating technologies, which are protected by inventor's certificates and are currently being used at almost 1,000 enterprises of the country and at tens of plants of CEMA member countries, have been developed on the basis of theoretical and experimental research on electroplating processing at the Chemistry and Chemical Technology Institute of the LiSSR Academy of Sciences. Among them are enterprises of the automotive, instrument making, machine building, and other sectors of industry. The economic impact attained in production thanks to the use of the institute's developments exceeded 29 million rubles during the 11th Five-Year

Plan. In reality this impact is even higher since the new technologies are not only cheaper, but also ensure an increase in the quality of anticorrosion coatings and reduce the amount of toxic wastes of electroplating shops. While studying the problems of electroplating work is also being performed at the institute on the improvement of metal coatings due to the improvement of their anticorrosion-decorative, mechanical, and electrical properties while reducing their weight and replacing expensive and scarce metals with cheaper ones and on the development of a technology of electroplating processes with the least toxic wastes which pollute the environment. Technological processes, which reduce the consumption of nickel and other scarce metals to one-half to two-thirds, have been developed. It should be noted that in the country functional and anticorrosion metal coatings are applied to an area of 500 million square meters each year, moreover, from 0.3 to 0.5 kilograms of such metals as zinc, nickel, chrome, copper, and tin are consumed today for each square meter. It is not difficult to see what an enormous metal-saving impact can be achieved on the scale of the country by the use of the effective new technologies developed at the institute. Good anticorrosion coatings make it possible to obtain a huge saving of ferrous metals. In the LiSSR alone the anticipated economic impact from reducing the losses due to corrosion of metals and the expenditures on corrosion protection will be more than 30 million rubles in the 12th Five-Year Plan.

New electrolytes, in which the concentration of toxic metal salts is reduced to the theoretical minimum, are being developed jointly at the institute with research organizations in the machine tool building industry, and methods for the complete removal of toxic substances from the waste of electroplating production and technologies and equipment for recovering metals from waste water are being created. It is now possible to accomplish the task of establishing waste-free, ecologically clean electroplating works. A temporary scientific production collective, of which the Chemistry and Chemical Technology Institute of the LiSSR Academy of Sciences is the main organization, has been organized for this.

In 1988 this collective will have established a model waste-free electroplating shop at one of the Vilnius enterprises. It is proposed by the end of the five-year plan to change the electroplating works in Shayulyay over to work in accordance with the new technological cycle, and then to do so throughout the republic as well. Preparatory operations have already begun. Inasmuch as electroplating shops in the majority of cities in the republic are the most toxic and largest polluters of waste water, the ecological effect of using waste-free technologies will be very significant. Undoubtedly, experimental model electroplating shops at enterprises of the republic will become a prototype of waste-free electroplating works at all the country's machine building enterprises.

What are the most characteristic features of organizing the interaction of science with production in the Chemistry and Chemical Technology Institute of the LiSSR Academy of Sciences? First, it is the comprehensive fundamental study of the physicochemical bases of the electrodeposition of metals, which made it possible to identify the directions of the search for and development of new effective technologies. Second, it is semi-industrial tests of the new laboratory-developed technologies at the institute's production base. Third,

it is the development at the country's machine building enterprises of a system of the duplication of the institute's developments, which is free of bureaucratic superstructures and intermediate units.

The republic Scientific and Technical Information Institute is disseminating throughout the country information on the new developments of the institute on a mass scale. The Chemistry and Chemical Technology Institute is holding consultations, seminars, and schools and organizing mixed work groups and temporary laboratories consisting of specialists of the institute and production, which are implementing new technologies directly in plant shops. Model sectorial and regional electroplating shops, at in which new developments of the institute are being tested and disseminated throughout the sector and region, have been set up. The interest of its associates and the workers of enterprises in the rapid introduction of developments is being supported by mandatory material incentives.

The example of the Chemistry and Chemical Technology Institute shows how a regional academic institution has a significant influence on production throughout the country. Today this institute is the "trend setter" in the field of electroplating.

It is possible to name many works of other institutes of the republic academy, which have brought "local" collectives of scientists to the front line of Soviet science and determine its character on the world arena. There are the works of Lithuanian scientists on probability theory and mathematical statistics, theoretical atomic spectroscopy, semiconductor electronics, thermal physics, quantum electronics, biochemistry, and others. Basic research in these fields of science have made it possible to create developments in the field of scientific instrument making, semiconductor sensors, ultrahigh-speed transistors, microwave devices, specialized computers and programs, unique laser spectrometers, medical diagnostic equipment, and leukemia drugs, which are widely known in the country.

The magnetic field sensors created at the Semiconductor Physics Institute have already been used for several years now in milliteslameters that are being series produced by industry and hydrostatic pressure pickups are finding wide use at machine building enterprises. The ultrahigh-speed pulse devices and microwave converters, which were developed at the institute and are produced by its experimental plant, are being used at many scientific institutions and organizations of the electronics industry. Methods of contactless nondestructive diagnosis on the basis magnetoplasma waves in semiconductors are being used in material science.

The Mathematics and Cybernetics Institute of the LiSSR Academy of Sciences developed programs of automated control systems, whose use in several union and republic ministries is yielding a significant economic impact.

High-power laser units of the Physics Institute are being used to harden and reinforce metalworking tools.

An original device for diagnosing glucose in human blood has been developed at the Biochemistry Institute. It is ready for series production and will find wide application in medical practice.

As a whole Lithuanian scientists are actively participating in more than 40 union, republic, and interdepartmental programs and are performing joint work with scientists of the USSR Academy of Sciences and the academies of sciences of the union republics.

The example of the Chemistry and Chemical Production Institute shows that the most important units, which determine the success of introducing advanced achievements of science, are, on the one hand, the pilot works of academic institutes and, on the other hand, informal cooperation of institutions of different departments to accomplish the posed tasks. The implementation in production of fundamental technological decisions, as a rule, is of a complex nature and requires the participation of specialists of various types and skills, the interaction of enterprises of various departments, and the establishment of new specialized works.

Such works are already operating at the institutes of the LiSSR Academy of Sciences. Among them are the specialized minicomputer and semiconductor instruments plant attached to the Physics Institute, the Pilot Plant of Laser and Electronic Technology Plant of the Physics Institute, and the Experimental Plant of Programs and Assemblies of Computerized Instruments attached to the Mathematics and Cybernetics Institute.

The main feature of these pilot plants is their very high scientific support, in which not only scientific associates of the highest skills from the sponsor institutes, but also workers of the sectorial institutes and design bureaus, where the most complicated assemblies of plant products are developed and optimized, are participating. Such cooperation makes it possible to create the most complicated scientific instruments and semiconductor devices and high-quality programs. These enterprises have really become centers of service by science of the needs of the national economy. The products of the plants are used not only at enterprises of the republic and at institutes of the LiSSR Academy of Sciences, but also at many institutions of the USSR Academy of Sciences and other scientific organizations of the country.

Cooperation of the institutes and pilot works of the Academy of Sciences with sectorial scientific research institutes and works today is the basis for the accomplishment of the tasks of the further acceleration of scientific and technical progress. Here, however, there are problems, the essence of which have been set forth in the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000: "To attach priority importance to the development of basic science, which predetermines the attainment by social production of a qualitatively higher level. To strengthen the technical orientation in the work of academic institutes. To increase the role of sectorial and republic academies."

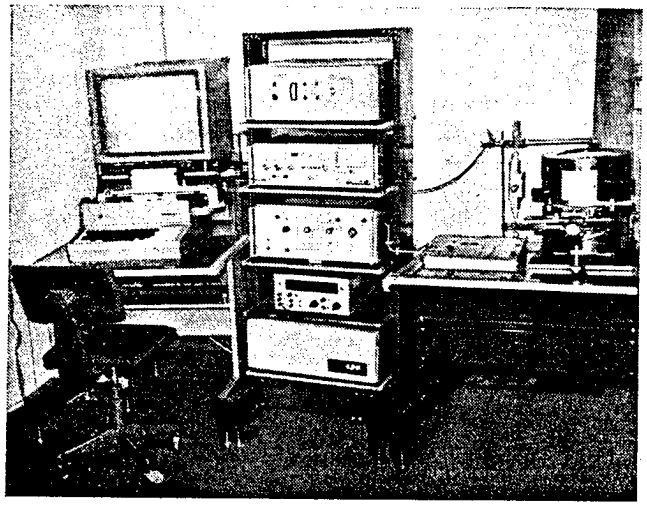

Figure 1. Gelikon unit developed at the Semiconductor Physics Institute of the LiSSR Academy of Sciences that is intended for nondestructive quality control of semiconductor materials.

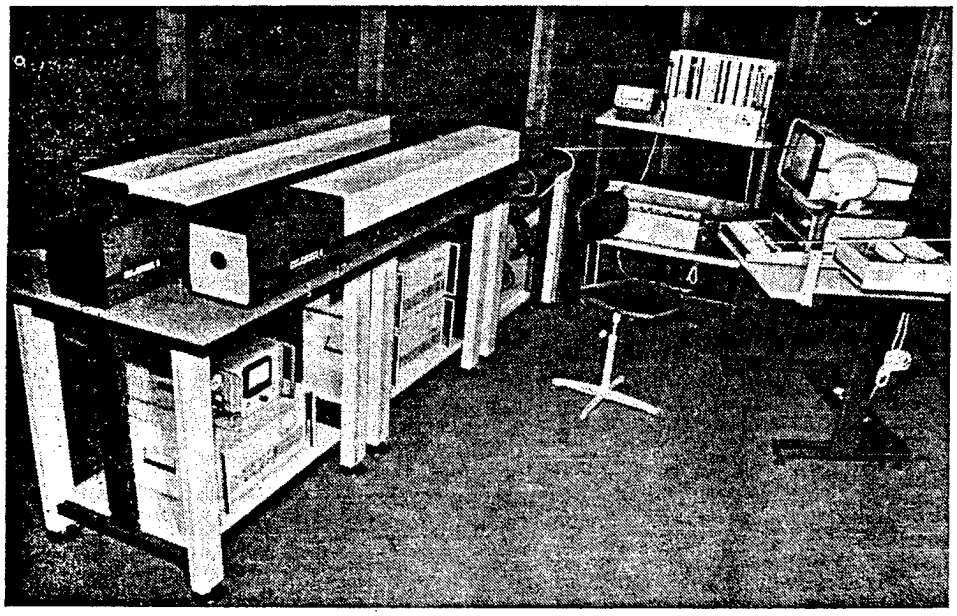

Figure 2. Viyuka flexible laser measuring complex, which was created at the Physics Institute of the LiSSR Academy of Sciences and manufactured at the Pilot Plant of Laser and Electronic Equipment attached to this institute.

At present basic research is primarily carried out at academic institutes and higher educational institutions of the country. They are planned and financed mainly as nonproduction sectors of the national economy. The participation of basic science in scientific and technical progress is ensured mainly by jobs which are performed in accordance with economic contracts with industrial organizations. The contact of science with production, as we see, is realized by means of orders of industry to science, among which, of course, current problems of production dominate. Basic research on the problems of scientific and technical progress in production is conducted mainly at the expense of the nonproduction portion of the budget, and the results of such research are introduced with difficulty into production. Inasmuch as the majority of academic and VUZ organizations do not have a pilot production base, many basic developments that are useful for practice turn out not to be brought up to introduction in production. The negative attitude toward the "raw" developments of scientists is objectively determined by production workers' lack of sufficient labor and material resources for the freedom of maneuvering which involves the assimilation of an innovation, which, in addition, is fraught with some risk.

In my view, it is possible to single out three tasks, the accomplishment of which plays a decisive role in increasing production efficiency by using the achievements of basic science.

First, it is necessary to streamline the financing and provision of basic research with materials and equipment. Works directed toward accomplishing specific tasks in a given sector of production should be financed and supported at the expense of this sector. It is necessary to give academic scientific institutions and higher educational institutions the right to place orders for equipment and materials in industrial ministries, for which these academic institutes and higher educational institutions, which are performing research in accordance with economic contracts (that is, on their order), should be "their own" organizations. Concern for strengthening the technological base of basic science, which corresponds to the basic specialization of the sector, should become their legally established duty. Such legitimized "guardianship" will sharply increase the effectiveness of the basic research being conducted at higher educational institutions and the academies of sciences, which in turn will result in a significant acceleration of scientific and technical progress in the sector. It is necessary to note that wherever sectorial organizations understand the need to help academic science accomplish the tasks of its works, the problem of introducing scientific achievements is solved more rapidly and with fewer difficulties.

Second, it is necessary to strengthen the pilot production base of academic institutes and higher educational institutions; moreover, it is necessary to create an academic industry for developing the latest unique technologies and instruments, in which an army of doctors and candidates of sciences of academies and higher educational institutions of the country would actively work. The academic industry would not only ensure a high technological level of the scientific experiment and complete partnership when assimilating in production the latest achievements of the basic sciences, but would also "impose" upon production finished advanced technologies.

Along with establishing a powerful academic industry it is necessary to strengthen and develop small specialized works attached to institutes and higher educational institutions: together they constitute a significant force and help accomplish many tasks of scientific and technical progress in the region. Such enterprises of the academies of sciences could also become a component part of the academic industry, since the leading scientific associates of academic institutes and higher educational institutions are actively participating in their activity.

The main difficulty in the operation of these works is material and technical support. All the products of these enterprises are single-design (not series-produced). Materials and instruments, which are often scarce and centrally allocated, are needed in small quantities for their production and making into complete sets. The practice of "fetching" necessary items: pieces of cable, radio components, integrated circuits, special metals, chemical reagents, microcomputers, and so on, has formed. Such a practice has become firmly established at both scientific institutions and higher educational institutions, inasmuch as the needs for many "trifles" often arise unexpectedly when scientific research is being conducted. There is hardly an enterprise in the country that has not dealt with scientific associates and instructors of higher educational institutions, who are applicants for instruments, materials, and equipment. Unfortunately, according to existing legislation the release on the side of centrally allocated products is impossible. What remains to be done? It is necessary by hook or by crook "as an exception" to drum up products for experimental production.

The time has come to make changes in the already formed structure of technical supply for the prompt revision and redistribution of the assets, which are released for materials and equipment, in favor of innovations in science. An innovation is an innovation because its origination often does not coincide with the moment of distribution of assets. To delay its appearance by a year or two, until the conditions for its origination appear, is an extremely barbaric measure with respect to it.

Third, the further strengthening of interdepartmental cooperation of scientific and production organizations with different specialization both for the introduction of the results of scientific research and for the conducting of basic research is necessary. In the republic, and throughout the country, there are still reserves of the more effective use of the powerful detachment of scientists of higher educational institutions and sectorial institutes for the solution of these problems. There are many already tested forms of organizing interdepartmental cooperation. It is necessary that they assume a professional character. Interdepartmental scientific technical complexes [MNTK's] and temporary collectives, which are established by decisions of central governmental organs, are such forms. In our view, the practice of creating similar intersectorial organizations should be developed, and local governmental and party organizations should be given the right to establish such temporary interdepartmental organizations on the initiative of the USSR Academy of Sciences and the academies of sciences of the union republics.

The Republic Academy of Sciences and Problems of the Region

There are now more than 15,000 scientists in Lithuania, among them there are nearly 500 doctors of sciences and 6,000 candidates of sciences. In all nearly 40,000 people work at 67 scientific institutions of Lithuania. This powerful scientific potential is being used both for the development of the basis sciences and for the accomplishment of many tasks of industrial and agricultural production in the region. The broad spectrum of specialties of scientists in the republic, including in the area of the basic sciences, whose development most active influences scientific and technical progress, makes it possible in case of the cooperation of the scientific forces of different departments to solve major complicated problems of the increase of the standards of production and product quality at republic enterprises.

To organize such cooperation the LiSSR Academy of Sciences acted as the initiator of the establishment in the republic of integrated public scientific production associations, which to a certain degree are serving as public prototypes of the MNTK's now being established in the country.

The Elektronika Scientific Production Complex [NPK], which unites 2 academic and 4 sectorial institutes, a number of departments and problem laboratories of Vilnius University and Kaunas Polytechnical Institute, and 10 enterprises in the electronics industry, was the first to be established. The program of the scientific production complex is the automation and robotization of production by using computers and the development of new items of semiconductor and electronic technology.

The complex exists not as a temporary collective to accomplish a specific task, but as a permanent union of specialists--physicists and mathematicians, engineer-developers, and producers of electronic equipment--for the development of new items with the highest parameters and the accomplishment of today's tasks on automating and robotizing production at enterprises and organizations of the electronics and electrical engineering type. This union is based on powerful research, production, and technological subdivisions of scientific research institutes, plants, and academic institutes, which complement and support one another. It needs to be said that few even central institutes, which have as powerful and universal a base and such a trained staff of specialists has been united in the Elektronika NPK.

In its 3 years of existence the scientific production complex has completed more than 100 developments that have provided just the organizations belong to the scientific production complex a saving of more than 5 million rubles. The complex is now working on 16 major tasks, among which are the development of automated control systems and microcomputers, means of control of the production of picture tubes at the Panevezhis Ekranas Plant and the television equipment at the Shyaulyay Plant imeni 40-letiya Sovetskoy Litvy, the substantial increase in the quality and technical level of televisions, the development of specialized integrated circuits and semiconductor sensors (transducers) for machine tool building and electrical equipment enterprises, the development and introduction of computer-aided design of radio measuring and electronic equipment, the development and production of new electronic apparatus for medical diagnosis, and others. The operations completed at

Elektronika do not end with the development of individual mockups and specimens, but are brought up to the pilot production of small series.

The experience of this NPK has been transferred to others which govern the scientific and technical progress of the production sector. The Pretsizionnaya vibromekhanika Scientific Production Association, whose main organization is the Laboratory of Precision Vibration Engineering of Kaunas Polytechnical Institute, is already functioning. The Galvanotekhnika Association operates under the direction of the Chemistry and Chemical Technology Institute of the LiSSR Academy of Sciences. The Physics Institute of the LiSSR Academy of Sciences became the main organization of the Lazery Scientific Production Association. L.K. Maksimovas, chief of a department of the Lithuanian CP Central Committee, Deputy Chairman of the republic Council of Ministers Yu.L. Rusenko, and Deputy Chairman of the republic State Planning Committee A.Yu. Iovarauskas were appointed chairmen of these collectives. The participation of party and soviet organs in establishing and managing the scientific production associations ensure the surmounting of the interdepartmental barriers which arise during intersectorial cooperation. Despite the fact that these scientific production complexes and associations have only existed for a few years, they have made it possible to solve many major problems, which are aimed both at the improvement of production technology and at the development of new technologies that yield an economic impact of tens of millions of rubles. It is important to note that through scientific production associations academic institutes and higher educational institutions bring the achievements of world science (and not only their own developments) into production.

Today socialist production requires of science not only industrial technology, but also rather integrated scientific service in settling questions of economic and social development. Together with the city party committee, as well as the city soviet executive committee of Shyaulyay, the LiSSR Academy of Sciences organized such an integrated service of production and educational organizations of the city with the participation of all academic institutes. Sociologists, botanists, power engineers, physicists, economists, historians, parasitologists--all have found an application for themselves. Around 50 laboratories of virtually all the academy's institutes have completed more than 150 most different jobs. Interdepartmental laboratories and groups, which are making a significant contribution to increasing the standards of production and labor productivity, have been created at city enterprises. The economic impact from introducing academic developments comes to more than a third of the entire economic impact obtained by city industry by the assimilation of new equipment. The cooperation of the LiSSR Academy of Sciences with Shyaulyay encompasses not only technical fields, but also such fields as historical and sociological research, the reduction and monitoring of environmental pollution, and others. At the LiSSR Academy of sciences personnel of the highest skills--doctors and candidates of sciences--are being trained for higher educational institutions and enterprises of the city.

The experience of organizing the multilevel interaction of scientific, design, and production organizations of various departments in the republic shows that an increase of the effectiveness of interaction can be achieved if the public

interrelationships of the partners, which are backed economically, acquire a legal status.

Here mainly the experience of organizing contacts of institutes of the exact and technical sciences with industrial enterprises and sectorial scientific research institutes was discussed. In reality the discussed problems concern all specialists and all collectives of the Academy of Sciences. It is also planned to strengthen the cooperation of scientists of different departments and to establish interdepartmental chairs and laboratories. Here the LiSSR Academy of Sciences is also acting as the initiator of cooperation on the completion of specific jobs, while rejecting bureaucracy and the formal coordination of plans of scientific research.

12794
CSO: 8144/3707B

MEETING OF AKTIV OF NADEZHNOST MASHIN INTERBRANCH COMPLEX

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 5, 3-16 Mar 87 pp 1-2

[Article by Ye. Georgiyev: "The Strategy of Reliability"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] It is possible to call the meeting of the party and management aktiv of the Nadezhnost mashin Interbranch Scientific Technical Complex, which was held in February at the Institute of Machine Science imeni A.A. Blagonravov of the USSR Academy of Sciences, the second birth of the complex.

Without being afraid of being mistaken, it is possible to say that the Nadezhnost mashin Interbranch Scientific Technical Complex holds a special place among the interbranch complexes that exist today. In its essence it is called upon to accomplish exclusively intersectorial tasks. It is clear that the problems of the choice of a main organization and the formation of a system of subordination, financing, and management are acquiring particular urgency precisely for it.

President of the USSR Academy of Sciences G.I. Marchuk stated the essence of reorganization. While retaining for academic science the role of a generator of ideas and a coordinator of work, machine building ministries and several enterprises that are producers of electronic equipment are being attached to the complex. In particular, the Ministry of the Automotive Industry, the Ministry of Instrument Making, Automation Equipment, and Control Systems, and the Ministry of the Aviation Industry have great possibilities in the designing and production of instruments, equipment, and stands.

The composition of the conference participants: responsible officials of the CPSU Central Committee, the Presidium of the USSR Academy of Sciences, the Bureau for Machine Building of the USSR Council of Ministers, the State Committee for Science and Technology, coperforming ministries, scientific research institutes, and enterprises, testifies to how serious the attention of the party and government to the problem of the reliability of machines is.

The automotive industry is implementing in its products the achievements of a wide range of sectors of the national economy. And, hence, it can become a proving ground for the testing of new developments.

Vice President of the USSR Academy of Sciences Academician K.V. Frolov, director of the Institute of Machine Science imeni A.A. Blagonravov, described the structure of the program of the interbranch scientific technical complex. He directed the attention to those who had gathered to the need for conducting basic research on the reliability of machines. Its results--the methodology of designing parts of machines and evaluating their reliability--should be turned over in the shortest time to machine builders.

Its next item is the improvement of state standards as the basic means of product quality control on the basis of the work of institutes of the USSR State Committee for Standards.

The source of the still low standards of the experiment, K.V. Frolov stressed, is the shortage of reliable sensors, recording systems, and measuring complexes.

Today, when automated production is being developed and robotics is being introduced, we also cannot do without new metrological means of the continuous monitoring of the geometric forms of items, the quality of their surface, and other parameters. Here laser, vibration acoustic, and other types of advanced instruments have great possibilities.

The statement of I.S. Silayev, chairman of the Bureau for Machine Building attached to the USSR Council of Ministers, will stick in the memory of the participants of the meeting of the aktiv first of all for the anxiety voiced by him about the present state of affairs in machine building. The introduction of state acceptance showed that the failure to observe technological and production discipline and the erraticness of deliveries had the result that with respect to a number of items being produced the plan of January of this year was not fulfilled at 60 percent of the machine building enterprises. The instances of the violation of labor and technological discipline and of deliveries of low-quality components lie on the surface, and it is possible to eliminate them quickly.

But design flaws and the low quality of the construction materials being used have also appeared. It is already much more difficult to combat this, as well as the shortage of test beds and monitoring equipment.

Our designers can develop and are developing machines which with respect to many of their indicators are not inferior to foreign models, or else surpass them. But in reliability a lag in our country is not an uncommon case. We do not know how to incorporate reliability in a design and cannot evaluate it at the early stages of tests. Defects most often come to light already during expensive and lengthy performance tests. It is necessary to give them up, but this will become possible only when design and rapid experimental methods of predicting the reliability of all machine building products come into practice.

But there is no time for a build-up. All this is needed today, or rather was needed already yesterday. And the main, strategic line here is the development of domestic measuring and testing equipment.

Under the conditions, when interbranch scientific technical complexes are being converted to cost accounting, the question of close contact with the users of products is becoming urgent. Permanent exhibitions and trade fairs and the establishment of direct relations between enterprises should play an important role here.

7807
CSO: 1814/125

PRIZES FOR METHODS OF EVALUATING INVENTIONS AWARDED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 5, 3-16 Mar 87 p 2

[Article: "The Results of the All-Union Competition"]

[Text] Having considered 250 version of "The Methods of Evaluating the Significance of Inventions," which were submitted to the All-Union Competition,(1) which was announced by the joint decree of the State Committee for Inventions and Discoveries and the Central Council of the All-Union Society of Inventors and Efficiency Experts of 9 January 1986, the Collegium of the USSR State Committee for Inventions and Discoveries and the Presidium of the Central Council of the All-Union Society of Inventors and Efficiency Experts, on the basis of the suggestions of the competition commission, resolved:

Taking into account that none of the submitted methods satisfies the set of requirements, which were stipulated by the conditions of the All-Union Competition, not to award a first prize.

To award second prizes of 600 rubles each to:

--A.I. Komov and G.B. Komissarova (Leningrad);

--E.P. Skornyakov (Moscow).

To award third prizes of 400 rubles each to:

--Ye.B. Kolbachev (Novocherkassk);

--Ye.G. Piven and N.I. Belyankina (Yaroslavl).

To award incentive bonuses of 200 rubles each to:

--A.V. Abramov, O.G. Aleksandrov, N.G. Matveyeva, and O.K. Trunin (Leningrad);

--A.V. Volkov (Moscow);

--I.I. Dakhno (Kiev);

--S.S. Rzhevskiy (Sumgait).

To award 33 participants in the competition certificates of the USSR State Committee for Inventions and Discoveries and the Central Council of the All-Union Society of Inventors and Efficiency Experts for drawing up drafts of methods, which are of definite applied scientific interest.

[Signed] The Organizing Committee

Deputy Chairman of the USSR State Committee for Inventions and Discoveries B.Ye. Kurakin, chairman of the Organizing Committee, comments on its decision:

The formulation of a method of evaluating the significance of inventions was begun at the All-Union Scientific Research Institute of Patent Information back in 1984. The first version of the procedural recommendations was not completely satisfactory. The formulation of instructions, in which four criteria were used for the evaluation of the significance of inventions for their selection and introduction in the national economy, in 1985 was continued by a group of specialists of the State Committee for Inventions and Discoveries and the State Committee for Science and Technology. However, as a result of their checking the group of specialists came to the conclusion about the feasibility of a single criterion--"topicality and promise."

The next stage of the work on the method was the decision on the enlistment in it of patent experts, inventors, and specialists of the national economy themselves--on a competitive basis. The State Committee for Inventions and Discoveries and the Central Council of the All-Union Society of Inventors and Efficiency Experts announced the All-Union Competition, the results of which are published above.

The All-Union Conference "Advanced Methods of Evaluating the Significance of Inventions" was held prior to the tallying of the results of the competition. During it a survey, the results of which made it possible to rank eight evaluation criteria, which were selected during the competition, was conducted for the study of the opinions of skilled experts. The results of the performed work attest that for the solution of the problem it is not necessary to confine oneself to the framework of the discussion of some one evaluation system, but an analysis of a number of working versions of evaluation systems should be made. This will also make it possible to select a limited number of them for experimental checking.

Subsequently it is proposed to examine three systems of the evaluation of the significance of inventions.

The mechanism of examination, its performers and stages, the drawing up of the results, and others can be worked out after the final selection of one of the three systems which are targeted for checking.

The development of the method is continuing. The uniting in it of the efforts of specialists of the State Committee for Inventions and Discoveries with the initiative of the inventors and representatives of industry and sectorial

patent services, who were enlisted in the competition, substantially enriched the arsenal of elements, on which the method can be based.

FOOTNOTE

1. See NTR, No 2, 1986, p 2.

7807
CSO: 1814/125

- END -